

Vol. II

TRANSCRIPT OF RECORD

50.4.

Supreme Court of the United States

OCTOBER TERM, 1938

No. 3

THE SCHRIBER-SCHROTH COMPANY, PETITIONER.

28.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 4

THE ABERDEEN MOTOR SUPPLY COMPANY, PETITIONER,

28

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 5

THE F. E. ROWE SALES COMPANY, PETITIONER,

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

ON WRITS OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT.

PETITION FOR CERTIORARI FILED JANUARY 7, 1938.

CERTIORARI GRANTED MAY 31, 1938.



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THE CHAPTERED PRINT CORP. MY. CHRYSTAN CORPORATIO Plaintiffs Appellants,

Two Sousann Sonsore Convert Defendant Appellee.

THE CLEVELLED PROFT CONCESSES CHATTHER CORPORATIO Plantilla Appellonts,

THE ARRESTS MOTOR SUPPLY COMPANY. Detendant Appellee.

THE CHAVEDAND TRUET COMPANY. CHRYSIAN COMPONENTON,

Plaintiffs Appellants,

THE F. E. ROWS SALES COMPANY, Defendant Appellee.

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nited States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

E CLEVELAND TRUST COMPANY, EYSLER CORPORATION,

Plaintiffs-Appellants,

VB.

B SCHRIBER-SCHBOTH COMPANY,

Defendant-Appellee.

CLEVELAND TRUST COMPANY,

EYSLEE CORPORATION,

Plaintiffs-Appellants,

VB.

ABERDREN MOTOR SUPPLY COMPANY,

Defendant-Appellee.

CLEVELAND TRUST COMPANY,

Plaintiffs-Appellants,

VB.

E F. E. Rowe Sales Company,

Defendant-Appellee.

No. 4045.

No. 4046.

No. 4047. Equity.

THE DISTRICT COURT OF THE UNITED STATES,
FOR THE NORTHERN DISTRICT OF ORIO,
EASTERN DIVISION.

TRANSCRIPT OF RECORD

unital and Sur-rebuttal Testimony, Papers Subsequent to Trial and Appeal Papers.

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INDEX.

VOLUME I. TRIAL PAPERS

In Case No. 4045.

Caption/	n
Original Bill of Complaint	2
Motion of Defendant, The Schriber-Schroth Company, For Further and Better Statement and Further Particulars	14
Order on Motion of Defendant, The Schriber-Schroth Com- pany, for Further and Better Statement and Further Particulars, Overruling all but Paragraph IV B	16
Plaintiffs' Bill of Particulars	16
Petition of John H. Bruninga to Enter His Special Appearance, in Order to Enter a Special Appearance on Behalf of Sterling Products Corporation, for the Sole and Only Purpose of Objecting to the Jurisdiction	18
Order Granting Petition of John H. Bruninga for Leave to Enter Special Appearance of Sterling Products Corpora- tion—to Object to Jurisdiction.	.25
Answer of Defendant, The Schriber-Schroth Company, to Bill of Complaint	26
Notice by Defendant, The Schriber-Schroth Company, of Intention to Take Depositions.	41
Supplemental Notice by Defendant, The Schriber-Schroth Company, of Intention to Take Depositions, Attached to Venner et al. Depositions.	42
Notice	43
Order for Reference to and Appointment of Special Master	43
Stipulation of Plaintiff and Defendant, The Schriber-Schroth Company, Consolidating Cause No. 4045 with Causes Nos. 4046 and 4047 for Trial	45
Order Granting Stipulation Consolidating Equity Cause No. 4045 with Causes Nos. 4046 and 4047 for Trial, Etc	46
Amendment to Answer of Defendant, The Schriber-Schroth	48
Stipulation of Plaintiff and Defendant, The Schriber-Schroth Company, Re Narrative of Transcript.	49

ä

	0,			
Order Granting Stipulation of I Schriber-Schroth Company, Testimony in one Cause with of Other Two Causes	h Reference Th	ereto	in Eac	h
Order Approving Narrative For	m of Teshmon	y		. 50
Acknowledgment of Service of 1	larrative Form	of Te	stimon	y. 51
HARRATIVE FOR	w 00 400 7160	MV	1	2
	Martin Committee of the			There are
PLAINTIEFS	PLAINTIFFS' TESTIMONY. Re- Re-			
Name of the state	Direct (ross		Cross
W. F. Burrer	52	53	100	
Clarence A. Schroth		54		14
F. E. Rowe		54		. 55
Charles W. Whitney		58		
Zay Jeffries	58	90	183	208
Zay Jennes			254	260
A. J. Perfler	264	268	F 8	271
Plaintiffs rest				. 271
A. J. Perfler (Recalled)			273	274
A. 0. 27 state (275		
NAMES OF A STATE OF	TESTIMONY.	11	4	
DEFENDANT	TESTIMONI	PARTIE	Re-	Re-
Market and white the second of	Direct	Cross		
Gustave C. Monckmeier	292	304		
Herbert Frank Ellingham		319	•••	
George Ellingham		327	327	~1
Robert W. D Vornky	328	334	341	342
Booert W. D. Voraky			343	
Wm. M. Venner	343	354	367	371
Charles L. Chadwick		396	*407	410
Carries 1. Coadwica		9.4.	412	atantr.
James V. Saxton	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	416	419	419
ARTHUR V. DRADUII			idea Day	

Charles F. Gilbert	420	429	432	
Sidney B. Royalty		442	448	
Louis M. Stellman		459	467	470
dotter.		•••	471	
	472	538	573	585
•	•••	T (43)	590	•••
	UMB II.			
REBUTTA	L TESTIMONY.		Re-	Re
	Direct	Cross		
Alisle W. Rockhoff	A DESCRIPTION OF THE PROPERTY	600		•••
R. W. Randall	602	613	619	
Fred A. Mulrine				
Bert E. Rockhoff	to Transmission	630	633	•••
Wm. H. Rockhoff	150 March 150 Ma			
Frank U. Winchester	The second secon	648		
Ralph Murphy	651	658	663	
Stephen R. Castor	664	667	671	672
0		1	672	673
John L. Burns	674	683	694	695
			696	698
A. H. Edgerton	698	•••	***	•••
Edward J. Guliek	699	730	804	813
			825	826
C. H. Sweet	832	837	845	845
Jack Henderson	846	848	854	855
		1 × (8) (8) (8)	855	855
Milton Tibbetts	859	864	894	••••
Zay Jeffries		957	1048	1056
DEFENDANTS' SUI	REBUTTAL TE	STIMO	NY.	1
Walter L. Schoengarth				
		• • •	912	
George P. Dorris		1072	1062	1089

H	port of William D. Woods, Special Master.
	Pleadings and Issues
	Pistons, Subject Matter of the Suit
1	Claims of Patents Charged to be Infringed 1095
	Findings of Fact
1	Conclusions of Law
	Memorandum:
	Parties, Jurisdiction, Title and Joinder 1109
	Chrysler Corporation as Party Plaintiff 1109
	Aluminum Company of America as Party Plaintiff 1111
	Venno as to Sterling Products Corporation 1113
	Claims and Defenses
	Pistons Charged to Infringe
	Trunk Pistons and Expedients
	The Expired Franquist Patent
	Estoppel of Plaintiff to Deny. Utility of Franquist 1122
	Presumption of Operativeness
	Utility—Operativeness
	Starling Pistons
	Claimed to Infringe
	Validity of Gulick Patent in View of Rights Intervening Before His Original Application was Broadened 1141
1	Gulick 1911 and 1914 Pistons not Illustrated or Described in the Patent. 1148
	Gulick Patent Validity as Affected by Material Change in the Specification
	Mooers Patent Validity as Affected by Attempt to Broaden Original Application and Material Changes in the Specification
	Validity of Patents over Prior Art
	Gulick Patent and Prior Art 1153

		4 2
1 7 70	Invalidity or Lack of Invention	. 115
1	Jardine Patent and Prior Art	. 115
	· Maynard Patent and Prior Art	116
	Mooers Patent and Prior Art	116
(4))	Schmiedeknecht and Prior Art	116
· /	Prior Uses	116
	Monckmeier Pistons	
	Schoengerth Pistons	117
	Long Pistons	117
	Infringement	117
	Resort to "Symptoms of Invention" So-called, Unnecessary for Such Not Here Controlling	118
	Commercial Acceptance	119
	Acquiescence	118
	Prior Art not Cited in the Answer	118
	Alleged Copying by Defendants	118
P	laintiffs' Exceptions to the Report of the Special Master.	119
	Exception No. 1	119
	Exception No. 2	119
*	Exception No. 3	
	Exception Nos. 4 and 5	119
	Exception Nos. 6, 7 and 8	119
	Exception No. 9	119
1	Exception Nos. 10, 11, 12 and 13	119
	Freention No. 14	115
/	Exception Nos. 15 and 16	119
1	Exception Nos. 17, 18 and 19	120
/	Exception Nos. 20, 21 and 22	120
/:: *	Exception Nos. 23, 24 and 25	Acres de la constitución de la c
/	Exception Nos. 26 and 27	120
	Exception Nos. 28, 29 and 30	120
	▼	
F- 44-5 - 5 - 5 - 5 - 5	學 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	

0 -	and the state of t	
	Exception Nos. 31, 32 and 33 1205	
	Exception Nos. 34 and 35	
	Exception Nos. 36 and 37 1207	K
	Exception No. 38	
	Breention Nos 39 and 40 1210	
	Exception Nos. 41 and 42	
	Wasseties No. 43	
	Exception Nos. 44 and 45	
	Exception Nos. 46 and 4/	
	Exception Nos. 48, 49 and 50	
	Exception Nos. 51, 52 and 53	
	Execution No. 54	
	Exception No. 55	
	Presention Nos 56, 57 and 58	
	Exception Nos. 59, 60 and 61	
	Resention No. 62 and Nos. 63 to 97 Inclusive 1221	
	Exception Nos. 98, 99, 100 and 101 1225	
	Exception Nos. 102, 103 and 104 1226	
	Exception Nos. 105, 106, 107 and 108 1227	
	Exception Nos. 109, 110 and 111	
M	Properties on Exceptions to Master's Report 1229	
2.30	1230	١.
245	1231	
•	Allowing Anneal	
A	signment of Errors 1232	-
100 Mg.	Group A Assignment of Errors relating to Validity of the Gulick Patent No. 1,815,733	
36	Group B Assignment of Errors relating to Infringement of the Gulick Patent in Suit	
0	Group C—Assignment of Errors relating to Validity of the Jardine Patent No. 1,763,523	L

Group D—Assignment of Errors relating to Infringement of Jardine Patent in Suit
Group E—Assignment of Errors relating to Validity of Maynard Patent No. 1,655,968
Group F—Assignment of Errors relating to Infringement of Maynard Patent in Suit
Group G—Assignment of Errors relating to Validity of Mooers Patent No. 1,402,309
Group H—Assignment of Errors relating to Infringement of Mooers Patent in Suit
Group I—Assignment of Errors relating to Validity of Schmiedeknecht Patent No. 1,256,265
Group J—Assignment of Errors relating to Infringement of the Schmiedeknecht Patent in Suit 1249
Group K—General Assignment of Errors 1250
Citation 1251
Citation
Order Granting Stipulation for Filing Narrative Form Testimony in One Cause with Reference Thereto in Each of Other Two Causes
Order Extending Time to Nov. 24, 1934 for Lodging Narrative Statement of Evidence and Filing Praecipe and to Dec. 16, 1934 for Filing Transcript of Record in U. S. Circuit Court of Appeals
Order Extending Time to Dec. 14, 1934 for Lodging Narrative Statement of Evidence and Filing Praecipe and to Dec. 26, 1934 for Filing Transcript of Record in U. S. Circuit Court of Appeals
Stipulation Extending Time to Dec. 21, 1934, for Filing Practipe and Lodging Narrative Statement of Evidence 125
Order Granting Stipulation Extending Time to Dec. 21, 1934 for Filing Practipe and Lodging Narrative Statement of Evidence
Order Extending Time to Dec. 31, 1934 for Lodging Narrative Form of Testimony and Filing Practipe and to Jan. 25, 1935, for Filing Transcript of Record in U. S. Circuit Court of Appeals
Order Extending Time to Jan. 14, 1935 for Lodging Narrative Form of Testimony and Filing Practipe

Order Extending Time to Jan. 28, 1935 for Lodging Narrative Form of Testimony and Filing Practipe and to Feb. 23, 1935 for Filing Transcript of Record in U. S. Circuit Court of Appeals.	
Order Extending Time to Feb. 18, 1935 for Lodging the Nar- rative Form of Testimony and Filing Praccipe 1260)
Order Extending Time to Feb. 25, 1935 for Lodging Narrative Form of Testimony and Filing Practipe and to March 25, 1935, for Filing Transcript of Record in U. S. Circuit Court of Appeals.	1
Order Extending Time to March 15, 1935 for Filing Practipe 126	L
Order Extending Time to April 15, 1935 for Filing Praccipe and to April 25, 1935 for Filing Transcript of Record in U. S. Circuit Court of Appeals	
Order Extending Time to May 6, 1935 for Filing Praccipe and to May 16, 1935 for Filing Transcript of Record in U.S. Circuit Court of Appeals. 126	
Order Extending Time to June 15, 1935 for Filing Transcript of Record in U. S. Circuit Court of Appeals	3
Order Extending Time to August 15, 1935 for Filing Transcript of Record in United States Circuit Court of Appeals	
Order Extending Time to August 31, 1935 for Filing Transcript of Record in United States Circuit Court of Appeals	
Order Extending Time to Sept. 30, 1935 for Filing Transcript of Record in United States Circuit Court of Appeals	35
Stipulation that Appeals in Causes Nos. 4045, 4046 and 4047 be Consolidated in One Printed Transcript of Record, That Exhibits Used Therein may be Used in Each of Said Causes and That Repetition of Similar Pleadings in Each be Eliminated	66
Order Consolidating Appeals in One Printed Transcript of Record, That Exhibits Used Therein may be Used in Each of Said Causes, and Further Ordering Elimination of Repetition of Similar Pleading: in Each Cause	
Stipulation Re Digest of Exhibits	67
One Constinu Stimulation Re Digest of Exhibits 12	68

Praecir	e		. 1269
Defend Ab Cer	ants' Motion for Leave to Add to the Record ove-Entitled Case Defendants' Counter Prace rtain Letters	d in the	1273
Order Re	Denying Motion of Defendants for Leave to cord Defendants' Counter Practipe and	Add to	
Petition	n to Supply Last Eight Pages Missing from S' Exhibit 13 in the Above Cause on Appeal.	n Plain	1278
Order (Franting Leave to Supply Last Eight Pages 8' Exhibit No. 13	of Plain	1278
	ants' Counter Praccipe		
	Settling Contents of Becord		
	or Withdrawal of Exhibits.		
	tion Re Certification of Record		
	YOLUE DIL		
	PLAINTEPS' EXHIBITS.		
	W in last column signifies Withdrawn or O	Offered	
Nos.			Vol. III
1.	Piston Manufactured by Sterling Prod- nets Corporation and referred to in Answer	51	w
2.	U. S. Patent No. 1,815,733, July 21, 1931, to E. J. Geliek (Patent in Suit)	51	1283
3.	U. S. Patent No. 1,763,523, June 10, 1930, to F. Jardine (Patent in Suit)	51	1291
4.	U. S. Patent No. 1,655,968, Jan. 10, 1928, to H. E. Maynard (Patent in Suit)	51	1299
5.	U. S. Patent No. 1,256,265, Feb. 12, 1918, to V. E. Schmiedeknecht (Patent; in Suit)	51	1305
6.	U. S. Patent No. 1,402,309, Jan. 3, 1922, to L. P. Mooers (Patent in Suit)	51	1309
Su	ted Digest of Assignments of Patents in it (Offering of Assignments omitted from reative):		1
	Gulick Patent No. 1,815,733	day to	The state of
2-A.	Edward J. Gulick to Packard Motor Car Co.	51	1321

Ba.		Offered Vol. I	Printed Vol. III
2-B.	Packard Motor Car Co. to The Cleveland Trust Co.	51	1321
	Jardine Patent No. 1,763,523		
3-A.	Frank Jardine The Aluminum Castings Co.	51	1321
3-B.	The Aluminum Castings Co. to Aluminum Manufactures, Inc.	51	1321
3-C.	Aluminum Manufactures, Inc. to Aluminum Co. of America	51	1321
3-D.	Aluminum Co. of America to The Cleve- land Trust Co	51	1322
	Maynard Patent No. 1,655,968		
4-Δ.	Howard E. Maynard to Chrysler Corporation	OI	1322
4-B.	Chrysler Corporation to Aluminum Man- ufactures, Inc.		1322
4-C.	Aluminum Manufactures, Inc. to Aluminum Co. of America		1322
4-D.	Aluminum Co. of America to The Cleve	51	1322
	Schmiedeknecht Patent No. 1,256,26	5	
5-A.	Victor E. Schmiedeknecht to Frank J Kent	51	1323
5-B.	Warranty and Guaranty by Victor E	. 91	1323
5-C.	Frank J. Kent to Bohn Aluminum an Brass Corp.	. 01	1323
5-D.	Bohn, Aluminum & Brass Corp. to The Cleveland Trust Co.	e .	1323
,	The state of the state of the state of		
7.	Instruction Sheet to Purchasers of Exhibit No. 1.	x- . 52	
8	Ray Day Piston	A COLUMN	W

		ffered ol. I	Vol. III
Nos.	Ray Day Piston	53	w
10.	Letter, March 19, 1932 to American Gear Co. from Aberdeen Motor Supply Co. (Formal Offer not included in Narra- tive)		w
10A.	Advertisement (Discussed, 53)		W
11.	Circular Letter of Sterling Products Cor- poration (Formal Offer not included in Narrative)		1327
12.	Poster displayed by Defendants	53	. W
13.	Tabulation as to Sales Produced by Whitney	57	1328
14.	Large Drawing of Internal Combustion Engine	61	w
15.	Drawing of Cross Section of Cylinder and Piston Wall	67	1333
16.	Drawing of Cross Section of Cylinder and Piston Wall (Magnified)	67	1335
17.	Piston Manufactured by Plaintiff's Li- censes and duplicated by Sterling Prod- ucts Corp.	80	w
18.	Letter, March 24, 1932, in Reply to Exhibit No. 10 (Formal Offer not included in Narrative)	7	. w
19.	Letter of Mr. Bruninga to F. E. Rowe (Formal Offer not included in Narra- tive)		w
20.	Guliek Piston	156	w
21.	Blueprint D-2376X of Defendants' 3-N. Exhibit	190	1337

In the case of Exhibits which were formally offered on pages of the Original Transcript not included in the Narrative, reference to them is made by the use of the words as "Discussed," "Identified" or "Marked for Identification" in parenthetical brackets instead of by the use of figures in the "Offered" Column of this Index.

-		- 1	
med .		Offered Vol. I	Printed Vol. III
08.	Defendants! 2.M	304	
2	Blueprint D-2460X, of Defendants' 3-M Exhibit	190	1339
3.	Large Drawing of Ray Day Pistons	190	W
2.	Double-Walled Aluminum Piston	258	W
4 . 5 .	Consent Decree, Simmons Case	264	1341
26.	Conveyance, Declaration of Trust and Agreement between L. P. Mooers and George B. Pitts and The Cleveland Trust		
25.5	Co., dated March 7, 1922	200	1345
27.	Copy of Letter, Jan. 23, 1933, The Cleve- land Trust Co. to Chrysler Corporation		
DAT .	(Formal Offer not included in Narra- tive)		w
		Offered Vol. II	Vol. III
00	Bill of Sale, Amplex to Gulick	608, 61	7 1358
28.	Sketch by Randall of Gulick Piston	617	1359
29. 30.	Series of Blueprints of Gulick Motor	617	W
0.336	Cross Section Drawing Gulick Sleeve	Phi.	
31.	Valve Motor	. 011	1361
32.	Detail of Piston of Preceding Exhibit	. 617	
33.	Sketch, Gulick Piston (P.X. 62)	. 770	W
84./	Ebbs Physical Piston (Marked for identification, 565)		W
35-A.	Sketch by Winehester of Guliek Plato (Marked for identification, 638)		1365
35-B.	Sketch by Winehester of Gulick Pisto (Marked for identification, 638)	n	1367
35-C.	Sketch by Winchester of Gulick Pisto	n	1369
35-D.	Sketch by Winehester of Gulick Pisto (Marked for identification, 638)	in	1371
35-E.	Sketch by Winehester of Gulick Pisto (Marked for identification, 638)	n	1873
36.	Guliek 1911 Eketch (Identified, 701)	730	1375
37.	Gulick Written Description (Identifie	d,	1377

		Offered Vol. I	Printed Vol. III
Nos.			
38a.	Supplemental Contract between The Cleveland Trust Co. and Aluminum Co.	900	1378
Par	of America, dated April 26, 1924	252	1910
38b.	License Agreement between The Cleve- land Trust Co. and Aluminum Co. of	482	1381
33	America		
٥	Exhibit A to License Agreement (Agreement between The Cleveland Trust Co. and Nordyke & Marmon Co., dated April 23, 1920)	282	1393
38c.	License Agreement between Walker M. Levett Co., W. M. Levett Corp., Walker M. Levett and The Cleveland Trust Co., dated April 11, 1924.	The state of the s	1397
38d.	License Agreement between The National Piston Co., Gustave E. Franquist James E. Diamond and The Cleveland Trust Co., dated April 11, 1924	i 282	1403
38e.	License Agreement between Kant-Skore Piston Co. and The Cleveland Trust Co. dated April 11, 1924	19	1408
39a.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated Sept. 19 1927	282	1412
39Ъ.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated Oct. 15 1927	283	1413
39c.	License Agreement between The Clev- land Trust Co. and Bohn Aluminum Brass Corp., dated Sept. 15, 1927, wit Lists A and B attached.	h	1414
· he i	List A	000	1426
1.273	List B	283	1427
	A sylvania and the second seco	****	
39d.	Letter from Aluminum Co. of America The Cleveland Trust Co., dated Sept. 1 1927	19,	1428

		Offered Vol. I	Printed Vol. III	
Nos. 39e.	Letter from Aluminum Co. of America	aged.	1000	
35e.	to The Cleveland Trust Co., dated April	283	1429	
39f.	License Agreement between The Cleve- land Trust Co. and Bohn Aluminum & Brass Corp., dated April 25, 1928	200	1430	
39g.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated Dec. 24 1929	283	1434	
40.	Agreement between Bohn Aluminum & Brass Corporation and The Cleveland	density.	1435	
	Schmiedeknecht Patent No. 1,256,265	Offered Vol. II	Printed Vol. III	
42a.	Franklin Weekly Engineering Report for the Week Ending Oct. 5, 1918	r . 658, 663	1438	
42 b.	Franklin Weekly Engineering Report for the Week Ending July 20, 1918	.658, 663		
42c.	Franklin Weekly Engineering Report to the Week Ending May 3, 1919	658, 66	3 1440	
43.	Photostat of Drawing P-2912	. 663	W	
44.	Letter to E. C. Long from Franklin Mf	g. 663	1445	
45.	Letter to E. C. Long from Franklin Automobile Co., dated April 17, 1918.	663	1446	
4.	Gulick Sketch Made in Court of Fire Sketch of 1911 (Identified, 701)	st 730	1447	
445.°	Bineprint of Standard Excelsion Mot	or 1730	1449	
446.	Blueprint P-2912	693	1451	
47.	Piston Used by Excelsion Motor (Iden	730	W	
48.	Reproduction of Piston as Used by E	730	w	
49.	Excelsior Motorsycle Piston (Identification 709)	ed,	W	

200	Offered Vol. II	Printed Vol. III
Nos.	The Material Piston	
50.	Blueprint of Excelsior Motorcycle Piston (Identified, 709) 730	1453
51.	Gulick Sketch Made in Court of Piston made by Casting of Rockhoff 716	1455
52.	Letter, Packard Motor Car Co. to E. J. Gulick, dated Mar. 27, 1916 721	1457
53.	Letter, E. J. Gulick to Packard Motor Car Co., dated April 1, 1916 722	1459
54.	Letter, E. J. Gulick to Packard Motor Car Co., dated Dec. 4, 1916 722	1460
55.	Letter, Packard Motor Car Co. to E. J. Gulick, dated Feb. 28, 1917	1461
56.	Letter, E. J. Gulick to Packard Motor Car Co., dated May 18, 1917	1462
57.	Letter, E. J. Gulick to Packard Motor Car Co., dated Mar. 26, 1917 724	1463,
58.	Core box Used by Excelsior Motor & 724	w
59.	Pattern Used by Excelsior Motor & Mfg. 724	w
60.	Picture of Renault Type Car Driven by Gulick in 1911	1465
61.	Letter in re Above, dated Dec. 1, 1927, in re Loss of Original	w
62.	Gulick Exhibit No. 11 in Interferences 49,569, 49,570 and 49,571	1467
63.	Letter, Ray Stewart Gehr to E. J. Gulick, dated Aug. 22, 1923 (Identified, 811)	1469
64.	Letter, E. J. Guliek to Ray Stewart Gehr, dated Aug. 23, 1923 (Identified, 811)	. 1471
65.	Gulick Deposition on Interferences 49,569, 49,570 and 49,571, pages 40 to 103, inclusive	7 1479
	Index of Exhibits showing both Interference and Transcript Numbers of Exhibits	147

			- 44
-		Vel. II	Printed Vol. 111
Nos.	Edward J. Gulick:		and the Age
	Direct Examination	1.	1475
	Cross Examination	V .	1501
Tast	Re-Direct Examination		1518
	Re-Cross Examination		1526
	Re-Direct Examination		1530
	Re-Cross Examination	unities.	1531
66.	Patent Office List of Applications of El- mer C. Long filed in Patent Office	830	1532
67.	Record of Long Interference No. 45,569	831	W
67-A.	Record of Interference of Exhibit No. 65 (pp. 104 to 281) not-received	831	W
67-B.	Opinion of Examiner in Interference No.	832	1533
67-C.	Opinion of Board in Interference No	832	1538
67D.	Opinion of the Court of Patent Appeals	832	W
68.	Record of Interference No. 49,575		W
68-A.	Opinion of Examiner in Interference No.	. 832	1541 1544
68-B.	Ominion of Board in No. 49,575	. 832	1944
68-C.	Opinion of Court of Appeals of District of Columbia in Interference No. 49,575	. 832	1546
69.	Record of Interference No. 49,570		W
69-A(1). Opinion of Law Examiner in Interference	. 832	1548
	2). Opinion of Examiner of Interferences interference No. 49,570	m 832	1551
W	1). Petition for Rehearing in Interferent		1554
1	2). Opinion of Board in Interference N	832	
69-B(at the Board of Appeals in	n- 832	1568
		. / .	

EVI

		ffered ol. II	Printed Vol. III
Nos.	and a constant of Charles and		
69-C.	49,010	832	1562
70-A.	Opinion of the Examiner in Interference No. 49,571	882	1565
70-B.	Opinion of the Board in Interference No. 49,571	832	1570
71-A.	Head Portion of Piston of Franquist Type	944	W
71-B.	Skirt Portion of Piston of Franquist Type	944	w
72-A.	Head Portion of Piston of Maynard Type	945	W
72-B	Skirt Portion of Piston of Maynard Type	945	W
73.	Ricardo Type Piston	951	W
74.	Drawing Showing Dimensions of Defendants' Exhibit Monckmeier 3-V	952	1573
75.	Drawing Showing Dimensions of Defendants' Exhibit Monckmeier 3-W	952	1575
76.	Ford 1933 Piston	1048	W
77.	Agreement, Aug. 4, 1917, between Mooers-Pitts, Cleveland Trust-Sawyer, Sterling-Alexander (Formal Offer not in- cluded in Narrative)		w
78.	Ditto of March 7, 1922 (Formal Offer not included in Narrative)		W
79.	Drawing of Iron Piston Used by Dorris Motor	1000	w
80.	Sterling Piston with Steel Strut	1088	W
81.	Docket Entry, Gulick vs. Packard Motor Car Co		w
82.	Amplex Receivership Statement of Feb.	1090	W
83.	Amplex Receivership Journal Entry	1000	W
84.	Ruling of Examiner in Abandoned Appli- cation of Ray E. Day for Patent	385	1577

xvii

		Offered Vol. II	Printed Vol. III
Nos.	The second secon		-14
85.	Certified Copy of the Drawings of the Abandoned Application of Bay E. Day, filed January 10, 1923, Serial No. 611,698	1091	1579
86.	Patent Office Interference	•••	W
	DEFENDANTS' EXHIBITS.	+ 1 1	
No.	(W in last column signifies Withdrawn or	Omitted)
		Offered Vol. I	Printed Vol. III
Mos.	Drawing produced by Venner of Long 1916 Piston	° 352	1585
В.	Piston Used by Franklin	352	W
C.	Two Paragraphs from Service Department Bulletin, Sheet No. 262, April 8 1920, of Franklin Automobile Co., entitled "Long Type Pistons"	9	1587
D.	Seven paragraphs from Service Depart ment Bulletin, Sheet No. 289, Nov. 11 1920, of Franklin Automobile Co., en titled "New Design for Series Nine".	352	1588
E.	Piston Purchased from M. K. Weems.	. 352	W
F.	Long 1916 Type Piston	352	W
G.	Piston Purchased from Franklin Factor	y 352	W
H.	Article from Franklin Service Bulleti No. 348, April 18, 1932, of Franklin A tomobile Co., entitled 'The Oval Type Piston'	n 1- 20 352	1589
·ıL	Article from Page 1, Franklin Servi Balletin No. 369, Feb. 20, 1923, of Fran lin Automobile Company, entitled "Pi ton and Wrist Pin Knocks," and Dra- ing on page 2, entitled "Drill Jig for E tra Oil Holes in Piston"	•	1591
IJ.	Forfeited and Abandoned Application William M. Venner for Improvement Pistons, filed April 12, 1920, Serial N	488	1595

TAM

S. Heim		Offered Vol. I	Printed Vol. III
Nos.	Venner Drawing, Feb. 16, 1920		1603
K. L.	Letter from George J. Oltsch to Wm. M. Venner, dated Sept. 22, 1920	354	1605
М.	Photostat of page 149, showing Cut only in "The Gasoline Automobile," by Heldt, Vol. I	368	1607
N.	Article from Pages 8 and 9 of Manual for Trouble Shooters of Franklin Automo- bile Company, entitled "Piston Slap".	372	1609
0.	Drawing produced by Chadwick, Long 6-Slot Piston	392	1611
P(1&2)	Core Box	392	W
Q.	Core Box	392	W
R.	Small Piston of Type made for Oldsmo- bile Car or Northway Motor	392	. w
8.	Tracing of "Oldsmobile Six" Piston produced by Chadwick	392	1613
T-1.	Tracing produced by Chadwick of Long Pistons for Ford, Model T Car	232	1615
T-2.	Tracing produced by Chadwick of Long Pistons for Econy Car	. 334	1617
T-3.	Tracing produced by Chadwick of Long Pistons for Duscenberg Car	392	1619
U.	Weems' Advertisement on Page 124 o "Motor Age" for July 7, 1921	. 394	1621
V, V-1 t	(Marked for Identification, 385)		W
W.	Photostat of Trunk Piston added to b Chadwick to show T-Slot, Long Piston.	. 390	1623
X -	Digest of Defendants' Exhibit X, Agreement dated Sept. 20, 1919 between E. C. Long and M. K. Weems	407	1625
Υ.	Photostat of Drawing by Stellman, Lon 1916 Piston (Identified, 462)	g	1627
2. /	L. M. Stellman's Report, dated Mare 18, 1919, entitled "Test on Long Pi tons"	sh s-	1629
	# 17 m		

		Offered Vol. I	Printed Vol. III
Nos.	Digest of Defendants' Exhibit AA, Li- cense Agreement dated March 20, 1919, between E. C. Long and Franklin Mfg. Co.	454	1632
CC (1).	Blueprint D-793X of The Aluminum Castings Co. (Drawing of proposed de- sign of piston for H. H. Franklin Mfg. Co.)	466	1633
CO (2).	piston for H. H. Franklin Mfg. Co.)	466	1634
CO'(3).	Blueprint D-960X of The Aluminum Castings Co. (Drawing of proposed de sign of piston for H. H. Franklin Mfg Co.)	466	1635
DD.	Sketch of Long Piston seen by Royalty in 1913		1637
EE.	Sketch of Long Piston by Royalty in February, 1918	n	1638
FF.	Sketch of other views of piston shown i	n	1639
GG.	Photostat of Pattern Record Car	d 413	1640
нн.	Photostat of Pattern Record Car marked A 640	d	1641
III.	Photostat of Pattern Record Car marked B-122	. 111	1642
JJ.	Photostat of Pattern Record Car marked H-4	415	1643
KK.	Photostat of Pattern Record Car marked C-123	rd 415	1644
TL.	Card bearing notation, "Use Patt. A-6	40 415	
MM.	Card bearing designation, "Patt. A	No. 422	-
NN.	Casting	427	W

		Vol. I	Vol. III
Nos.	Strut Type Piston (Offered as Plaintiff's Exhibit No. 41)	591	W
BBB.	Piston, Six Cylinder Chevrolet	55	· W
CCC.	Piston, Four Cylinder Chevrolet	590	W
DDD.	(No Exhibit)		
EEE.	Cut-in-half Piston like Spillman and Mooers	590	w
FFF.	Piston made in Permanent Mold	590	W
3-G.	Cross-section of Piston like Exhibit 1	590	W
3-H.	Cast Iron Type Piston	590	W
3-I.	Clamping Device used as Can Opener	590	W
3-J.	T-slot Piston used in Ford 8	590	W
3-K.	Piston, Silv-O-Lite	590	W
3-L.	Circular of Silv-O-Lite Piston	590	W
3-M.	Willys-Overland Rough Piston Casting (Marked for Identification, 135)		w
3-N.	Oakland Rough Piston Casting (Marked for Identification, 135)		w
3-0.	T-slot Piston, Another Piston	590	W
3-P.	Small Section, Alleged Spillman and Mooers	1	w
3-Q.	Ribbed Piston, Alleged Franquist 1,153,902 Structure		w
3-R.	Half-Section, Gulick Piston	590	W
3-8.	Page 274 of "The Automobile Engineer" of October, 1918, Vol. VIII, No. 119.	590	1647
. 3-T.	Piston in Exemplification of Guliel	930	W
3-U.	Letter, McCoy to J. King Harness, Dec 30, 1932	. 000	w
3-V.	Monckmeier Cas. Iron Split Skirt Piston	a 590	W
3-V'.	Kant Skore Piston	. 590	W
* 7			9/ .

		Offered Vol. I	Printed Vol. III
Nos.			
3-W.	Monckmeier Aluminum Split Skirt Pis- ton	. 000	W
3-X.	Letter, dated June 20, 1916, with Monck- meier Photo	. 001	1648
3-Z.*	Depositions: Venner, Chadwick, Stell- man, Royalty, Saxton, Gilbert	7.0	W
4-A.	Stellman Sketch of Maynard Patent Structure	590	1649
4B.	Photostat of Roots Superimposed on	590	1651
4-C.	Decision of Law Examiner, dated Apri 4, 1924, in Interference No. 49,569	532	1653
4-D.	Decision of Law Examiner, dated Apri 4, 1924, in Interference No. 49,574	. 532	1659
4-E.	Decision of Law Examiner, dated April 4, 1924, in Interference No. 49,580		1661
4F.	Decision of Law Examiner, dated April 7, 1925, in Interference No. 49,575	. 002	1663
4-G.	Pages 362, 363 and 364 of "Automotiv Industries" for Jan. 29, 1920	.00.,00	1 _1667
4·H.	Prior Art Patents	.539, 59	1
40	U. S. PATENTS:	1	
4 .	No. 700,509 May 20, 1902 H. E. El	ha	1671
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	No. 908,569 Jan. 5, 1909 F. D. H	D	1679
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		200000	
	No. 1,153,902 Sept. 21, 1915 G. E. F	ranquis	t 1687
	No. 1 174 000 Mer. 7, 1916 W. L. S	choenga	rth. 1693
	No. 1,195,936 Aug., 22, 1916 C. White	е	1699
	- 100	Mamatin	e et nage

^{*}Exhibit 3-7 is erroneously referred to in the Narrative, at page 472, as Exhibit 3-Y.

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No. 468,595 of 1914 Chenard and Walcast. (Translation of foregoing). 1767
No. 434,147 of 1911 M. Chas. Emile Serex 176
(Translation of foregoing). 1773
No. 16,362 of 1912 M. Chas. Emile Serex 1777 (Translation of foregoing). 178
German Patent:
No. 176,988 of 1906 Otto Lietzenmayer 178
ADDITIONAL U. S. PATENTS:
No. 1,557,625 Oct. 20, 1925 L. M. Stellmann 178
No. 1.842.022 Jan. 19, 1932 S. D. Hartog 179
No. 1,499,073 June 24, 1924 L. H. Pomeroy 180

VOLUMB IV.

Nos.		Vol. I	Vol. IV
41.	Royalty Report of June 30, 1927 of The Cleveland Trust Co	591	1809
4J.	Pages 602, 603 and 604 from "The Auto- mobile" of March 12, 1914	591	1827
4-K.	Pages 558, 559 and 560 from "The Auto- mobile" of March 5, 1914	591	1831
4-L.	File Wrapper and Contents of Gulick Patent (No. 1,815,733) in Suit	578, 591	1835
4-L,	File Wrapper and Contents of Mooers Patent (No. 1,402,309) in Suit	591	1977
4L,	File Wrapper and Contents of Jardine Patent (No. 1,763,523) in Suit	591	2027
4-L4.	File Wrapper and Contents of Schmiede- knecht Patent (No. 1,256,265) in Suit	591	2129
4-L.	File Wrapper and Contents of Maynard Patent (No. 1,655,968) in Suit	591	2147
4-M.	Page 555 of "The Horseless Age" for April 8, 1914	591	2229
4-N.	Page 1081 of "The Horseless Age" for December 24, 1913	591	2231
40.	Pages 85 and 86 of "The Automobile Engineer" for March 12, 1914	591	2233
4-P.	Postal Showing Staver Car	591	2237
4-Q.	D'Vorsky Sketch of Monckmeier Piston	591	2239
4R.	Stipulated Digest of Defendants' Ex-		
	hibit 4-2, The Anamosa Journal, Anamosa, Iowa, Thursday, June 10, 1915	591	2241
4-8.	Same as Plaintiffs' Exhibit 38b	277	1381
4.T.	Same as Plaintiffs' Exhibit 38	282	1378
4.U.	Same as Plaintiffs' Exhibit 39	282	1412
4-V.	Same as Plaintiffs' Exhibit 40	287	1435
4 W.	(No Exhibit)		A

Nos.		Offered Vol. I	Printed Vol. IV
4-X.	List of Patents owned by The Cleveland Trust Co. Under Trust	288	2941
4-Y.	Bill of Complaint and Answer in Case No. 27-32 in the U.S. District Court for the Southern District of New York, The Cleveland Trust Co. vs. The National Piston Co., Inc.	291	2243
	Answer	291	2254
	Final Decree	291	2259
4-Z.	Bill of Complaint in Case No. 535 in the U. S. District Court for the Eastern District of Michigan, The Cleveland Trust Co. vs. E. C. Long Piston Co. and E. C. Long	290	2261
5-A.	Letter of Evans & McCoy dated October 25, 1930 (Formal Offer not included in Narrative)		w
5-B.	Option Agreement of October 13, 1930 in the above (Formal Offer not included in Narrative)		w
5-C.	Page 250 of "The Motor World" for Becember 28, 1931	591	2271
5-D.	Page 133 of "Automobile Trade Jour- nal" April, 1916	591	2273
5-E.	Page 504 of "Automobile Engineer" for December, 1920	592	2275
53F, to 8	F ₁₂ . Stipulated Digests of Various Publications:		
~	. 5-F; to 5-F.	592	2277
	5-F, to 5-F,	592	2278
5-G.	Stipulated Digest of Certificate from Secretary of State, for State of Illinois, Staver Motor Car Co.	14.	2279

Nos.		Offered Vol. I	Printed Vollay	*
5-H ₁ .	Stipulated Digest of the Decision of the Law Examiner in Interference No. 45,851	. 598	2279	
5-H ₂ .	Stipulated Digest of the Decision of the Examiner in Interference No. 45,851	593	2279	ı
5-H _a .	Stipulated Digest of the Decision of the Board of Appeals in Interference No. 45,351	593	2279	,
5-I.	Books of Account Pages V-1, V-2, V-4	594	2280	
	Bill of Complaint in Case No. 3510 in the U.S. District Court for the Northern District of Ohio, The Cleveland Trust Co. and Chrysler Corp. vs. The Simmons			
11.	Mfg. Co. and Sterling Products Corp,		2285	
5-J.	Letter dated October 17, 1982 from Anna Landon Duke to J. H. Bruninga	595	2303	
		Offered Vol. II	Printed Vol. IV	¥
5-K1.	Letter dated May 4, 1915 from Walter L. Schoengarth to Louis Bagger & Co	899	2304	
5-K,(1).	Tracing of Schoengarth Piston	699	2305	
5-K,(2).	Tracing of Schoengarth Piston	899	2307	
5-K,	Three pages Description by Scheengarth of "The Adjustable Gas Engine Piston"	899	2309	
5-K4.	Letter dated May 18, 1915 from Louis Bagger & Co. to W. L. Schoengarth	899	2810	
5-K ₈ .	Letter dated May 22, 1915 from W. L. Schoengarth to Louis Bagger & Co		2811	
5-K.	Letter dated May 27, 1915 from Louis Bagger & Co. to W. L. Scheengarth		2811	*
5-K,	Letter dated July 29, 1914 from W. L. Schoengarth to Louis Bagger & Co	899	2812	-
5-Ka.	Letter dated August 5, 1915 from Louis Bugger & Co. to W. L. Schoengarth		2313	,

THU

. .

	Nos.		Vol. II	Printed Vol. IV
	5-K.	Certified copy of Application Papers of the Schoengarth Patent No. 1,174,092	899	2314
	5-K10.	Schoengarth Piston	907	w
	5-K11.	Letter dated April 2, 1917 from Louis Bagger & Co. to Walter Schoengarth	907	2325
	5-K ₁₂ .	Envelope sent to Schoengarth at Cleve- land	912	2327
	5-L.	Franquist Piston Construction	1051	w
	5-M.	List of Patents to Packard Motor Com- pany (Discussed, 889)	1091	2329
		CARE. NO. 4046.	0	1
	Caption			. 2331
	Notes Re peal	Trial Papers, Orders, Testimony, Exhibits Papers. CASE NO. 4047.	and Aj 2332	to 2342
	Notes Re	Trial Papers, Orders, Testimony, Exhibita	and A	0-
	App	xtending Time to October 10, 1935 for Filt of Record in United States Circuit	Court o	of. . 2355
1	Certificat	a of Clerk		. 2357
1	(Property)	T. D. C. C. A. Shith Circuit	7 00 0 0 V 01	3073
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REBUTTAL TEMPENONY.

Thereupon Plaintiffs called as a witness in rebuttal Alexan W. ROCKHOFF who, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Alisle William Rockhoff. I live at 8335 Cloverlawn, Detroit. My age is 36. I am at present Foreman at the Burroughs Adding Machine, Detroit.

I knew Edward J. Gulick while he was connected with the Amplex Motor Company—I am not sure of the name "Amplex"; it might have been American Simplex: the name was changed so many times, I am not sure of the name of that company. That was about 1912 to 1914, along in that period. My recollection is not clear on this date. I worked in my dad's foundry at the time I knew Mr. Gulick, which was the American Castings Foundry, located across the street from the Amplex. My father's

name is William.

That foundry specialized in motor castings and did a little vacuum-sweeper work. They worked only in aluminum. They made castings for the Amplex Motor Company, and for Mr. Gulick. Other than pistons I don't recall any particular castings for Mr. Gulick. We made these castings for Mr. Gulick in the period between '12 and '14; I rather think it was the latter part of '13; I can't definitely tell that. I saw those castings in my dad's foundry. I know they were made for Mr. Gulick because at the time he took a personal interest in that particular work, and he very seldem came over to the foundry, and I remember him over there at the time that these castings were made, examining them. I recall them more at the time after they were machined, that he had them rough-turned, and they were declared defective because of porce or porcess castings, I think that is what they called them. I thid not see them being machined, but I saw them before and after they were machined. The last time I saw them they were on a little work band out in the foundry.

I have one recollection of these castings; they were flat top, and there was nothing unusual in the size of them; that an ordinary piston, no concave work on the

I have one recollection of these castings; they were flat top, and there was nothing unusual in the size of them; just an ordinary piston, no concave work on the outside, just the cylinder, as I recall it. The castings were like an aluminum cylinder, approximately 3" in diameter, 4" long, rough-turned, and a flat top. I don't

remember anything else about them. I don't recall that Mr. Gulick ever got other than piston castings from my father's foundry.

Mr. McCoy: Direct closed.

CROSS EXAMINATION by Mr. Bruninga.

I finished high school at the age of 18; and it was, I should judge, three years previous that I saw those castings; so I must have been between 14 and 16; it may have been but one year previous. I connect up the period with the time that father closed the foundry, and that date is the beginning of 1915. I connect that with my graduation in the year 1915. I think it was in the year 1915 that I graduated, but it was previous to that that I saw this casting. I don't know definitely how much previously, but it was between '12 and '15. I am testifying from memory, and connecting the dates with my high school and closing the foundry.

It is not fiction in my mind as to the happenings; very definite; that part is not a fiction, because I was

acquainted with everybody concerned.

Originally the Amplex company was the American Simplex Motor for a short time, and changed to the Amplex Motor Car Company, and then changed to the Amplex Auto & Machine Company, and then to the Gillette Motor Company, and they changed it so often in the short period that I don't know which one it was. That company was in Mishawaka, Indiana. My father's foundry was either just on the edge of the city limits of Mishawaka or right in the city limits, but it was located either on the boundary of the city limits or just inside of the city limits. It was country outside of the city limits.

I testified previously for Mr. Gulick in an interfer-

ence proceeding before the Patent Office.

These two places were right across the street from each other; it was the main highway out of the city, and

one on one side and one on the other.

I worked in my father's foundry during vacations, and I also worked there spare time, when called upon, on Saturdays. I saw Mr. Guliek around there off and on, but not a great deal. I don't know whether he was there during the entire four years; I don't know whether he was there that long or not, because I didn't see him the four years continually there. I would say he was around there the first or second year. I would feel that the years '13 and '14 would be when he was there. He was there a good deal, as I recall it.

The name of my father's company was The American Castings Company. They referred to it by the name of the Rockhoff Foundry because he was the owner of it.

This order of Mr. Gulick's which I have been talking about/was defective, and they had to replace them. There was one particular batch of castings I had in my mind. I remember other batches of castings that looked like piston castings, I have seen them in the foundry. I have seen piston castings in the foundry from other people, at the time I attended high school. Amplex did cast iron casting and they never had any there. These were aluminum piston castings. There was more than one batch of piston castings made for Mr. Gulick. I say we replaced the defective batch and another batch; previous, I don't remember. I think that was the first batch, when they were found defective, they had to be replaced.

My father was in active control of that business during the period I have been talking about. He is 71 now, so I should judge he was 58 at that time. He was active; the foundry employed 25, 30 men, and he worked right out with the men, supervised the work. The orders were given to my father. If there was any trouble about defective castings, I should judge he would look at them

pretty closely; that was his practice.

In those days we machined aluminum castings a rough turn to see whether they were defective. After the machining, the porous holes, sand and blow holes, would show up, where they wouldn't if you didn't machine them. Where castings were defective, they would be brought back in the machined condition, and I associated the fact that these were machined by the fact that they were returned. A good deal enters into that.

I would consider my father's statement as to what these eastings were, pretty accurate, in other words, if my father made a statement as to how these eastings were constructed, I would take his word for it rather than my own memory. I remember pretty distinctly that I graduated from high school in 1915. My father's age then was about 50, and he was an active man. His age was fifty some in 1918. I am now 36.

R. W. Randall, a witness called by Plaintiffs in rebuttal, and first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is R. W. Randall; age 51; and reside at Milwaukee, R.F.D. No. 9, Station F. My present occupation is sales manager, Briggs & Strutton Corporation. Since 1911 I have been connected with the automobile manufacturing industry, manufacturing motors, motor parts, automobile parts, and at present manufacturing

gasoline motors.

I know Edward J. Gulick. I first met him in 1912, I think it was, at Mishawaka. I am not sure what Mr. Gulick's occupation was at that time, but I think he was connected with the Excelsior Motor Company in Chicago. He happened to be in Mishawaka, and he was formerly with the Simplex Motor Car Company; and he came out to the plant. I was there. At that time it was the Amplex; and I introduced myself.

The Simplex plant was located in Mishawaka on the Lake Shore tracks, at Beaver Street, I believe it was.

That was in Indians.

My position at the Amplex Company was general manager. I occupied that position from 1911 until 1914. I think the company changed names in the meantime. Originally it was the Amplex Motor Car Company, and I believe through receivership it passed into the Amplex Manufacturing Company. The receivership was in 1913

or 1914; I don't recall the date.

There was a change in the management of the company at that time. At the time the Amplex Manufacturing Company took it over, it was purchased by Mr. Pulcifer; Mr. Gulick came to Mishawaka at that time as secretary of the company. That was in the early part of 1914, the late spring. Mr. Gulick's position at the plant was secretary of the company and chief engineer. I don't know just when Mr. Gulick did leave that company, because I left before he did. At the time Mr. Gulick came with the Amplex Motor Company, we were manufacturing motors and motor cars. The motor was a four-cylinder, two-cycle motor, and the car was the conventional type of automobile being built at that time, known as the Amplex car.

We changed the construction of the Amplex car; the car in general was much the same, but the motor construction was changed from a two-cycle motor or fourcylinder, two-cycle motor, to a six-cylinder, four-cycle motor. We bought that motor from the Buda Company at Harvey, Illinois. This change from four-cylinder to the six-cylinder Buda motor was in 1914. Mr. Gulick made the suggestion of this change in this way: he had designed a six cylinder motor, drawings of which he brought over with him; it was a little different type of motor than had been built up to that time. It was a sleeve valve motor. In order to get changed over quickly and get some money coming into the plant, we decided to put in this Buda motor until such time as we could get the Gulick meter, which was a sleeve valve motor, coming through.

Mr. Gulick talked to me about his motor design. He didn't have complete drawings. He had a general, you might say an assembly drawing, showing the idea and the principle of it; and we were working up the details of the job for production. The sleeve construction was discussed between us, to quite some extent and materials used were discussed, and in that discussion we brought out the question of clearance and improvements of de-

sign, and this aluminum piston construction.

The aluminum piston construction that was talked about at that time was a slit skirt type of piston, and the bosses were carried to the top or head of the piston—weren't connected to the sides of the piston. There was a slot running around the piston so as to take care of the

expansion of the lower skirt of the piston.

The slot running around the piston was just below what we call the wiper ring section of the piston, or the lewer ring. The slot went through the wall and carried completely around the piston. That slot separated the skirt from the ring or head-carrying section of the piston. The skirt was carried through a section of the side wall, as I remember it. There was a section about %" wide at the pins. It has been quite some time since I saw it; my memory isn't quite clear on that exact detail; but there was a diagonal slot in the skirt of the piston that ran to the extreme end, and the slot running around the piston. The slot extending diagonally of the piston skirt, ran pretty close to the groove, I would say. That is, the lower ring groove, the first groove above the wrist pin hole. The diagonal slot ran almost to or cut into the slot that ran around the piston skirt; I wouldn't be sure, my recollection is not clear on that point.

There were some pistons made up, not exactly to that construction. We had previous to Mr. Gulick's connec-

tion with our company, done some experimental work on a six-cylinder sleeve valve motor, and in this motor we used aluminum pistons. They were the conventional type, and we had trouble with them. When this question came up of Mr. Gulick's design, I talked to him about this piston, having in mind the tropics we had experienced on the previous type; and our troubles were that the piston would seize if we had it tight enough so it wouldn't slap; if we got it so it wouldn't seize, it slapped. I remember making the remark at the time that that was the very thing we were trying to kill; with this idea, you would get a piston that would fit tight and still not have it seize. We took the patterns that those original pistons were made from, it happened to be pretty close to the size Gulick had, and made up some sample pistons to prove the theory, and put them into this Buda motor. Now, that piston was slotted in a very similar manner to what he had in mind, but the wrist pin bosses weren't anchored to the top of the piston, as he had originally designed it. There were some slight changes made in the core box, and the nattern itself required a little lagging, but the core box was changed so as to strengthen up the rib construction on the wrist pin bosses. And that is the piston that we eventually tested in this Buda motor.

Mr. Gulick's general drawing of his motor was turned over to our engineering department, which at that time was in charge of Mr. Frank Winchester, and he started working out the details for manufacture, with other draftsmen that we had in there in our engineering department. There was a young man by the name of Rockhoff, who was a draftsman there at that time. I don't remember his first name. His father operated a foundry across the road. That is why the thing comes

to my mind. He was just a lad at the time.

The job of designing that motor was directly under Mr. Gulick, Winchester was the chief engineer so far as the drafting room was concerned, and prior to Mr. Gulick's connection with our company was our engineer. When Mr. Gulick came in he was recognized as the engineer of the company. He was in very close contact with the work on those drawings. Those drawings were never finished in detail. There were some parts finished. I believe some patterns started on some of the parts, but they were never finished while I was there. I believe I could recognize those drawings.

8

Mr. Bruninga: Before the witness looks at those drawinga, I believe it is incumbent upon you, Mr. McCoy, to have him at least sketch what he saw, rather than simply rely upon the rough drawings, unless you only intend to identify what those drawings show, and then ask him about what he saw, later on in the course of the examination.

(Narrative continued) I was in the drafting room occasionally. My position there of necessity brought me in contact with those drawings. I actually saw Mr. Winchester, Mr. Rockhoff and Mr. Gulick working over those drawings. I saw a tracing made of the general assembly. I can't recall any definite parts.

Mr. Winchester's full name was Frank U.

There really wasn't any name put on that motor in our plant. The drawings that Mr. Gulick brought over from Chicago just bore the signature "E.J.G. Motor." Those initials indicated Mr. Gulick's name, I presume. It is not customary to name a motor in a manufacturing plant until after it is born and something done with it.

The castings for the manufacture of that piston were made at the aluminum foundry right across the road from the Amplex plant, operated by a Mr. Rockhoff, I don't recall his full name. That foundry was located directly across the road, on the New York Central Lines, from the Amplex Motor Company. I saw the castings in our plant. They were machined in our tool room by a fellow by the name of Johnson, I think, was the foreman of the tool room at that time. I saw the castings after the machining was completed. I think there were some seven or eight castings altogether and a set of six of them completed up for this motor. Those completed pistons were made up with a groove construction, had . the rings the same as the conventional type piston; the skirt was split from the lower ring grave down to the end of the skirt, split through. There was a slot ent around the piston on either side extending from the wrist pin boss to the wrist pin boss. There was a slot entirely surrounding, but it wasn't a continuous slot. The slot was discontinuous because in the construction that was used on those experimental pistons, the boss construction for carrying the wrist pintwas such that you couldn't go all the way through. The boss was carried up by ribs to the top of the piston, and also extended up underneath what we term the land section of the piston which carries the ring, and that rib naturally would prevent

you from going up all the way through. The slot extending around the piston separated the skirt from the head section of the piston. The character of the connector passing from the bess to the piston head is quite hany in my mind at this time. As I recollect it, there were two ribs running up from the boss to the top of the piston. Now, just what the sections of them were and the exact contour and shape, it has been so long ago that I couldn't remember that. Those two ribs were located one on each boss; that is the best recollection I have of the construction. The ribs extended vertically with respect to the wrist pin axis, and were in the plane of the wrist pin axis. They connected to the boss structure on the top section of the boss. The ribs connected with the incide wall of the ring land portion.

The slot between the head and the skirt portion of the piston was formed by the cutting of the milling slotting saw. I didn't see that operation, I couldn't re-

There was a slot running diagonally through the skirt of the piston in addition to the slot extending around the piston. This diagonal slot was alightly to one side of the wrist pin, leoking at the piston in the plane view, the slot was off to one side. I can't recall the amount it was removed from the center of the thrust face of the piston; it was slightly off-center, though.

When I saw these finished pistons they were in the tool room of our plant. The only thing that causes me to recall it is the discussion we had; relative to this discussion, I was quite interested in knowing whether or not it was going to overcome the difficulties we had.

The patterns we had on hand for this experimental motor we had previously built with the aluminum pistons. That pattern was changed some; I believe the pattern was lagged up for diameter, and there were some slight changes made in the core box; it was in relation to the boss support of the wrist pin bosses, the ribbing. I don't recall the details of the changes.

The purpose of making up these pistons was to prove the theory of the split skirt piston, primarily. The theory was that the piston could be fitted closer and thus not get the seizure from action when the difference in the expansion of the two metals occurred, and at the same time reduce the noise of the motor. These specimons were tested by putting them into this Buda motor and by putting them on the road in this car and driven.

I refer to the experimental car that we used in connection with the Buda motor installation. The car was a company car at that time. Mr. Gulick had general charge of the driving of that car. Louis Blick was the foreman of the department at that time and naturally the work of supervising, manufacturing, fitting and mounting of these pistons in the car would come under his jurisdiction. Mr. Gulick was with the work all the time; that was his business. After the pistons were installed in the car, the car was used in test work and demonstration work, and it was later sold to Mr. Gulick.

-The tests of the pistons in that car primarily was to determine whether or not this expansion and contraction of the piston was effective with this construction,

and it was proven in this test that it was.

Mr. Bruninga: I object to that as a conclusion of the witness. He should state in his own words what he bases his conclusions on.

The Witness: I was going to do that. Prior to the installation of these pistons we of course were using the type of cast iron pistons furnished by the Buda Company. After putting the aluminum pistons in, we found that we had a slightly better acceleration and we didn't have the slaps and knocks as we call them, in the motor. It was this piston as we had had on our previous motor in which we had used aluminum pistons without the

skirt with the slot.

(Narrative continued) I rode in the car in which these experimental pistons were placed, several times before the experimental pistons were placed in the car, and I rode in it afterwards. I was extremely interested in the pistons at that time. There were no other changes made in the car at that time. I rode in that experimental car several times after it was equipped with the particular pistons that I saw in the tool room of the Amplex Motor Company. There were six pistons put into that ear, the car having six cylinders. The car was completely equipped with these pistons, since you can't change pistons in a car without having six of the same kind of pistons.

The wrist pin in the aluminum pistons that were installed in this experimental test car, of which I have testified, was floating in the wrist pin bosses, to my recollection. The pin was locked at the connecting rods. That was not a conventional construction at that time.

The conventional practice at that time was to lock the piston pins and the piston by means of a screw or pin into the wrist pin boss, which made the pin a component part of the piston. And this construction was changed so as to permit the piston pin to float in the piston and relieve the piston from strain.

The test pistons were installed in the experimental car prior to its sale to Mr. Gulick. That time I have no way of fixing because I don't have anything to bring to mind just exactly what the interval of time might have been. In fact I couldn't say just when that car was sold to Mr. Gulick, except it was in the summer of 1914, but the exact time of it I couldn't say. I remember making out a bill of sale to it, because at the time that Mr. Gulick bought the car, he bought it with the view of getting settlement on some money he had advanced to the company, and I was beeing it on that. I made out a bill of sale on this deal, and I think I would recognize it. It was made out on one of our regular invesce forms.

(Witness examines Plaintiffs! Exhibit 28) This was the bill of sale covering the purchase of the model EK toy tonneau car No. 747, that I signed, and testify this is my signature. That is the car in which these aluminum pistons about which I have testified were tried out. I do not recognize the writing in red below my signature.

Mr. McCoy: Loffer in widence the bill of sale identified by the witness as Plaintiffs Exhibit 28.

Mr. Brunings I object to that exhibit because first it has not been definitely connected up with that perficular car, and, second, because matter has been inserted in red ink both on the face and in pencil on the back.

(Narrative continued) This bill of sale was made out July 16, 1914.

Mr. Sutherland: Let the record show the witness was looking at the paper when he answered the question.

(Narrative continued) I do not have an independent recollection as to the definite date that bill of sale was made out. The best recollection of it is the circumstance that brought about the sale, and that is the fact that the Amplex Manufacturing Company was not making the progress that it should in the financing of the company, and Mr. Gulick was trying to protect some of the money that he had put into it, by taking this car.

And that was all happening in about the middle of the summer of 1914. That is the nearest I can tie it up. The typewritten material was placed on this bill of sale on the date the paper bears. That typewritten material describes the car that was sold to Mr. Guliok at that time. There were no markings on the bill of sale below my name or on the reverse side at the time I signed it. The marking in blue pencil at the top of the bill of sale and also the exhibit marking were not on there at the time I delivered it. This bill of sale was delivered to Mr. Gulick in the middle of the summer, as near as I can recollect.

Q. I hand you a sheet of blank paper and a ruler and eak that you reproduce as near as you can the pistons which you saw mechined up on the beach in the tool room of the Amplex Motor Company and that you have intertestified were installed in the motor of the car described in the bill of sale, Plaintiff & Exhibit 28, that you have identified.

(Short recess taken while witness makes eketch.) Mr. McCoy: I have marked the sketch which the witness has made, as Plaintiffs' Exhibit 29.

Q. Will you please place letters of the alphabet on the parts of this piston that you have drawn and tell what they are!

(Narrative continued) Slot A, located above the wrist pin hole, in a slot running around the piston and not connecting at either and. B is a slot running diagonally lengthwise of the piston, connecting with slot A and opening through the lower and of the piston skirt. C is a single rib connecting the top of the wrist pin bose to the head of the piston. D is the skirt of the piston, which is straight, from a point marked Il to F. G is a portion of the piston carrying rings, and is undersised for clearance in the cylinder. I think that is all. The

slot running lengthwise of the piston, shown in the right hand view as B, is also shown as B in the left hand view.

The drawings made at the Amplex Motor Company plant, after Mr. Guliek worked at the plant, I believe carried a title at the lower right hand corner, with the draftsman's signature, ofther his name or initials, as to who made the drawings. I don't recall any specific name on the drawings. There might be a specification number there, or a name which would be descriptive, such as "cylinder" or "piston" or "consecting red," or ot

parts of the motor.

It was the usual practice to date drawings.

The series of blue-prints which you now show me, I identify as follows: The first print, marked A-2, is a complete assembly of the six-cylinder motor that we were working on at that time. I know that it was made at the Amplex Company because it bears Mr. Winchester's initials. This drawing A3 is the same motor a view taken from the opposite side. The blue-print has been printed from the wrong side of the tracing, and Mr. Winchester's initials are backwards, as appears in the lower left hand corner. That is a detail of the sleeve that was to be used in the sleeve valve Gulick motor.

The initials on drawing marked A-38 are Rockhoff's

initials.

The large blue-print marked "Crank case plan wiew, sheet 1" is a detail drawing of the crank case construction on the Gulick sleeve valve motor. The drawing and the tracing from which this blue-print was taken was made in the summer of 1914.

The blue-print marked "Gear cover" is a blue-print covering the detail construction of the gear cover used on the Gulick motor. The initials appearing in the lower right hand corner are Mr. Rockhoff's initials.

The blue-print marked A-47, is a detail of the water pump construction on the Guliek motor. The drawing was made by Mr. Rockhoff and bears his initials B.E.R. And Mr. Winchester's initials also appear in the lower right hand corner.

I recognize the drawing marked "Oil pan, sheet 1." It is a detail of the oil pan construction on the Gulick motor. The drawing was made by Frank U. Winchester. I know this because his initials appear on the lower right

hand corner. I recognize those initials.

The blue-print marked A-60 is the crank shaft detail of the six-cylinder Galick motor, made by Frank U. Winchester, whose initials appear in the lower right hand corner.

Mr. McCoy: The blue-prints which have been identified by the witness are marked for identification as' Plaintiffs' Exhibit 30.

(Narrative continued). The blue-print marked for identification "Plaintiffs" Exhibit 31," is a cross-section drawing of the Gulick sleeve valve motor, made by Frank U. Winchester, which I recognize by his initials in the lower right hand corner of the print. The original drawing from which this blue-print was taken was made in the summer of 1914. I saw them at work on this drawing, and I saw it after it was completed. Mr. Gulick was in the employ of the Amplex Motor Company at that time.

The blue-print marked "Plaintiffs' Exhibit 32" is a detail covering the piston designed for Gulick motor. The drawing was made by Mr. Rookhoff, which I identify by his initials in the lower right hand corner. I saw the original drawing from which this print was made. I saw tracings made, from which this blue-print was taken, at the Amplex Manufacturing Company at Mishawaka. Mr. Gulick was there at that time.

Beforring to the blue print, Plaintiffs' Exhibit 31, and the construction shown therein, the connecting rod was looked onto the wrist pin, permitting the wrist pin to float in the piston. That drawing shows the locking con-nection on the connecting rod. The pistons shown in the drawing, Plaintiffs' Ex-

hibit 32, were intended to be made of aluminum. The marking "Cast iron" on the face of this drawing would not change my opinion on that, because the common practice at that time was to make pistons of cast iron, and the draftsman would undoubtedly use the name "Cast iron" in that construction, without having been told differently.

Mr. Bruninga: I object to that as a conclusion of the witness.

The Master: Objection overraled.

(Narrative continued) The small bosses formed on the bottom of the wrist pin bearing in this Exhibit 32, was in accordance with the practice in cast iron construction; the pin was looked into the piston; it is also a detail. The left hand view of the drawing does not show this same construction. It shows an oil hole. The dotted lines indicated in back of the web structure that appears
to extend at a slight angle with respect to the vertical
axis of the piston, is intended for an oil return hole, I
believe. That is a 14" drill—yea, that is the same hole. That is a plain hole; it is not a tapped hole; it is a plain hole. That drawing plainly indicates that there is a hole in the top of the wrist pin boss of that piston as designed in the summer of 1914. That hole would be drilled in there, in accordance with our practice at the Amplex Company in 1914, from an angular direction so as to permit the drill to pass in from the open end of the piston. The drawing shows such construction. The drill is through this hole, continued on through this hole at the

top (indicating the bettom hole in the wrist pin boss and the top hole in the wrist pin boss). These same features of construction are also shown in the right hand view of the drawing. The right hand section shows the hole in the top of the boss connecting with another drilled

hole leading to the outside wall of the piston.

This sketch, marked Plaintiffs' Enhibit 33, is very similar to the pistons that we made up for the Gulick car. The only difference that I can recollect is in this cross-section here; this is shown with a double rib construction to the boss, referring to Fig. 2. And my recollection of that section was that it was a single rib instead of a double rib. Other than that the piston is very much the same. This doesn't show the slot, that section in there; it would out off with that slot, referring to Fig. 1. The diagonal slot does not show a continuation up to the slot running around the piston, due to the fact that half of this drawing is shown in section and half of it is shown in plan.

Mr. Braninga: That is objected to as a conclu-

zion.

Q. Is this the same piston that you have testified to that was installed in the engine of the Gulick car above in the bill of sale, Plaintiffs' Exhibit 28?

Mr. Bruninga: Objected to as leading. The Master: Objection overrand.

(Narrative continued) It is not the same piston. The design is approximately the same, with the exceptions that I have noted.

I believe I left the Simplex Motor Company in 1913. I left the employ of the Amplex Motor Car Company in April, 1915.

My association with Mr. Gulick was entirely at the Amplex Motor Car Company plant. That company went into receivership during Mr. Gulick's employ, in 1914. I can't recall the exact date on that; it is a matter of record. It was in the summer the proceedings were on.

I don't know where the original tracings, from which these blue-prints Plaintiffs' Exhibits 30, 31 and 32, were

made, are at the present time.

I testified in proceedings in the Patent Office in 1996, I believe it was, but I am not familiar enough with the case to know what the numbers 49,579, 49,570, and 49,571

refer to. That interference related to the same subjectmatter as this case.

I am not interested in any issue of this cause.

Mr. McCoy: The Witness is offered for cross examination.

Choos Examination by Mr. Brunings.

I met Mr. Gulick in 1912; he was with the Excelsion Company at that time. It may have been 1911. It was . two or three years prior to his coming over to Mishawaka. I was with the Amplex Company at that time. I just met Mr. Gulick in 1911. I don't know when he left . the Excelsior Company. I was acquainted with him from the time I met him in Mishawaka. My meeting him in Mishawaka was merely a giroumstance. He had no business connection there; he simply came over to the plant and I was introduced to him. In order that you may get this picture, he formerly was with the Simplex Motor Car Company as chief engineer, and I believe he had the title of Vice President, or something of that kind. When he came back to Mishawaka he came over to the plant. The Amplex Motor Car Company plant and the Simplex Motor Car Company plant are the same plant. He came ever to the plant and I was introduced to him at that time.

The first time Mr. Gulick told me anything about the piston was in 1914. He didn't tell me about a compensating piston before that.

... The diagonal slot, about which I testified in direct examination, connected to the slot running around the

In the aluminum piston that we need before Mr. Gulick came over in 1914, we tried different schemes of

oiling, by increasing the wil film around the piston, in an effort to rectify the trouble of slapping. With reference to Exhibit 29, in which I show a single rib extending from the faces to the head, that was common practice at that time. The construction sometimes ran from the piston bees up to the side wall, and then they cometimes ran it up to the top of the head; that is a variation in practice. I didn't make a separate core ber for that pisten; but I understood that Mr. Guliek did make some changes in the core bar. The original core ber, my understanding, was used with some changes to accommodate the change in construction of this rib.

I don't know that for a fact; the original core box might have been used. The patterns were simply lagged up. I think that was done at the foundry. I don't know that;

I was just testifying what somebody told me.

I didn't just hear that the pistons were machined by Mr. Johnson, I saw that. My recollection is that the slot ran from boss to boss, it didn't go all the way around. I said that the diagonal slot might have been on either side. There was only one diagonal slot; it might . have been on either side of the boss. There were twosemi-circumferential alots like A in Exhibit 29. When I said that that diagonal slot was slightly off-center, I meant that it was off-center from the boss, from the wrist pin bees. In oth words, the slot did not extend down from this point; it was off to one side of that bees. It would be hard to determine at this time just how much off-center it was. The slot was nearer the boss than it was the center line of the piston. As I remember it, it was about half way between the boss and the center line of the piston. It started approximately as shown in Fig. 1 and Fig. 2, from the point marked "X" and extended diagonally towards the bottom of the piston. It didn't go around the piston. That angle was approximately ten degrees, about the same slant as B. This sketch here indicates how the flot ran, just as it is.

The slot surrounding the piston was directly below the lower ring dividing the skirt section of the piston from the head section, and that extended nearly all the way around. It extended nearly half way around on one side, and then nearly half way around on the other side, and then there was a slot that extended downwardly on an incline. This downwardly extending slot started at the edge of this groove and went down to the bottom. It would start from one side of the center hole on Exhibit 3-H. I would say about half way between that center and the best. In other words, it started about half way in the center of the thrust face and the wrist pin best, and then it went diagonally down to the bottom of the skirt. You understand this is just a free hand sketch; it is not supposed to be to scale; it is supposed to indicate this alot is slightly off-center. It just depends on which side of this view, Fig. 1 of Exhibit 29, you are looking at, where the plot starts. If you are looking at one side, it would be over to one side. If you turn the piston half way around, it would be on the opposite side. To the best of my knowledge it would be as I have it sketched here, with possibly the exaggeration of location.

I can read drawings well.

Fig. 1 shows the slot B starting almost near the center of one of the thrust faces; almost near the center, and point X would be about half way between the center and the wrist pin bosses; the inside of the wrist pin bosses. In other words, there would be a starting point on Exhibit, 3-H practically %" from the edge of the relief, and then it extended downwardly diagonally. The pattern for that piston, as originally made, had one rib. I don't remember how many ribs the piston had that was actually tried out in that car. I may be wrong, but my impression was that the slots A went part way around; and the reason I think that is the fact that the construction of the piston as originally made wouldn't have provided for a slot to go clear through at that point.

All the pistons in the Amplex car sold to Mr. Gulick were made alike. I am quite sure the pistons in that car did not have a relief in the region of the wrist pin bosses, for instance, like shown in Exhibit 3-H. They were turned all the way around. They had a relief on the top section, or the ring groove section. That section was made smaller, which was common practice at that time. That piston was machined in our tool room by Mr. Johnson and proceeded with the operation from one to the other, and wouldn't come under my observation. The particular pistons like shown in Exhibits 1 and 2 (Figs. 1 and 2) which were later tried out in the Amplex car, had a straight skirt. I can't remember what clearance was allowed, at this time. It was in the matter of thousandths, a very small amount of clearance. The reason that that stands out in my mind quite fresh is because of the discussion that Gulick and I had at that time relative to the use of an aluminum piston, and we had arrued the point back and forth as to whether aluminum pistons could be used in that construction, automobile. The clearance allowed for these pistons was less than we allowed in aluminum pistons without the split; I would say that the skirt was approximately three thousandths less in diameter than the cylinder in which it was put, ... for the reason that in our first construction we didn't use a slotted piston; we used the solid type piston, and our clearance at that time ran about seven or eight thousandths. We found that with this practice we could decrease that amount of clearance, in fact that was the aim of the construction, to permit of a tighter fitting piston and not produce a piston slap. That piston had a floating wrist pin in it; by that I mean the wrist pin was

free of the wrist pin bosses; that is, the wrist pin goes

through.

I rode in that Amplex car when these particular pistons were tried out. There was no trouble experienced in the piston at any time while it was under my observation. I took a number of trips in that car. I would say that car was run approximately 65 to 68 miles an hour on pavement and on gravel roads around Mishawaka, extending over to Elkhart; most of our testing was done between Mishawaka and Elkhart: at that time it was about a half paved road and half gravel road. That was a water-cooled car. There was no trouble experienced with. seizing, even though there were no reliefs in the region of the wrist pin bosses on the outside, and with aluminum pistons.

In order that you may get the picture of that car, this car was used as an experimental car. Mr. Gulick, who was recognized as our chief engineer, had the use of that car practically to himself. This experimental work was carried on during that time. Later on the company became a little questionable as to whether they could carry on. Mr. Gulick had advanced some money to the company, and he came to me and made arrangements to transfer this car to him for a consideration, in order to take care of the money that he had advanced, and the actual transfer of the car to him, technically, you might say, was when this bill of sale was made over to him in July; but he had had this car in his use; it was a factory car up to the time we turned it over to Mr. Gulick. I couldn't swear as to whether those particular pistons were in that car when the bill of sale was made out to Mr. Qulick, because they might have had an oppor-tunity to take those pistons out without me knowing it. I did not place the particular notation in red ink on

the bottom of Exhibit 28, nor do I know who did. I don't

know whose handwriting that is.

It was the usual practice at the Amplex Company at that time to carry a date line and what you call a title line at the right hand corner of the print, especially on details. I would say that the drawings that I saw in 1914 had that particular notation on them, because our drawings carried that notation. Today is the first time I have seen the blue prints that were produced here, since 1926, I think it was It was at the time I testified for Mr. Gulick in the interference in which he was involved in the Patent Office.

Referring to drawing A 38, which is one of the drawings marked Plaintiffs' Exhibit 30, I would interpret that the sleeve is split. I also find that split in the drawing marked A1, Exhibit 31. I don't know why that sleeve was split; I don't know that it was to take care of expansion and contraction, but it would have some influence on it. Primarily it might have had a purpose. I wouldn't want to testify to that point, because I didn't design that particular construction. That is Mr. Gulick's design, and he didn't explain that to me. That is not the first sleeve valve motor I saw; I saw a Knight before that, and I built a sleeve valve motor myself before that. The sleeves were integral and not split at all. The Knight sleeve was integral and not split.

Q. I understand those drawings have not been offered in evidence as yet, just marked for identification.

Mr. McCoy: Then plaintiffs offer in evidence the set of blueprints marked for identification Plaintiffs' Exhibit 30; the blueprint showing a cross-section of the Guliek engine, marked for identification Plaintiffs' Exhibit 31; the blueprint showing the details of the piston construction, marked for identification Plaintiffs' Exhibit 32; the bill of sale marked for identification Plaintiffs' Exhibit 32; the bill of sale marked for identification Plaintiffs' Exhibit 39. These sketches, these exhibits, are offered in evidence under the same exhibit numbers as applied thereto for identification purposes, subject to substitution of photostatic copies for all of the exhibits offered.

Mr. Brusings: I have no objection to the substitution of photostatic copies, provided the exhibits are properly offerable in evidence. As to Exhibit 28, I object to that because the exhibit has obviously been changed since this witness has signed it, and that should be explained in some way or other by

some other witness.

As to Exhibit 29 I want to make an objection to that because I don't think it is a correct representation. I believe that goes more to the weight, however, than anything élse; I just want to preserve my objection. As to Exhibit 3I, that is not an original; that is a blueprint, a copy, and it has not been shown that the original has been lost, I want to make the same objection as to 32.

The Master: They will be received at this time,

with that reservation.

Mr. McCoy: This sketch marked for identification Plaintiffs' Exhibit 33, will not be offered at this time. (Sketch later offered in evidence as Plaintiffs' Exhibit 62, R. p. 770.)

(Narrative continued) That drawing, Exhibit 32, carries the title for cast iron, but it is my opinion that that is designed for an aluminum piston. It is the practice to make aluminum pistons with a skirt 1/16", and even thinner, of that diameter. It was not usual to make cast iron pistons with skirts 1/16" thick; it was usual to make them heavier.

In looking at this drawing, Exhibit 32, a second time, I believe that the small bosses were put on the bottom of the wrist pin bosses merely for locating points in drilling through to make the oil hole or reach the oil hole on the upper part of the boss. It would be necessary in such a case, in order to start the drill. The boss is round; in order to start the drill you would have to have a flat spot.

I said that Exhibit 33 represented my recollection as to the construction of those pisions that were put in the car that Mr. Gulick later bought, and that there was only one rib instead of two ribs; and it is my recollection that the slot was designed approximately that way. It was my intention that the construction shown in Exhibit 29 was to be about the same as shown in Exhibit 33, although I didn't have this drawing before me when I made this other one. On Exhibit 33 the groove is shown entirely around the piston, and on Exhibit 29 it is not. It is my recollection that the slot went only part way around, it being interrupted in the region of the wrist pin bosses. I don't know whether it had two ribs or one rib. I am assuming and think it had one rib, because the pattern originally was made with one rib; I don't know of any change. If it had two ribs it would be possible for them to go all the way around. I remember very distinctly of seeing all of these drawings before seeing them here today. I saw these particular drawings in 1926. I don't testify to seeing any drawings of pistona; there could be any number of blueprints made from the original ones. I mean the same design and construction.

I don't know whether any pistons like Exhibit 32 were ever made at the Amplex. I was there and away from there until 1915. At that time, in the summer of 1914, I was working also for another company down here near Cleveland on consulting work and reorganization of the company, and I went back and forth between the

two plants; so that my entire time wasn't devoted to that job:

I wasn't asked here to describe this particular piston as shown in Exhibit 32 before I was shown this blue-print; I did describe it in the case of Exhibit 29, I de-

scribed that first and then I made a sketch of it.

It is too far back for me to remember the diameter of the cylinder bore of the Gulick motor of these drawings; I could guess, but I don't believe it is advisable, to guess on such a thing. The diameter of the cylinder in that Amplex car was approximately 3½". In 1914 it was customary to allow .001" to the inch in diameter for cast iron pistons, and we allowed about double that for aluminum pistons. I am testifying entirely from memory. It is rather difficult to remember details, when

you go back to 1914.

I did not see any of those Gulick pistons like in Exhibit 29 after they had been run. I didn't see those pistons put in the car, but I knew they were put in there, because I knew they were working on the job at the plant. I did not actually see them put in. I knew the motor had been torn down. I saw that done. It was torn down to put the pistons in. My position at that time was manager of the plant, and I was in the office. The work was done out in our assembling department. I do know that those pistons were put in that automobile, because I was told they were in there. I can answer that maybe to meet your point in this way: the pistons were put in the motor for a test, and I was out in the car in that test and observed the action of the pistons to see what happened, and those pistons were in that car at that time. I couldn't swear that those pistons were in that car, because I didn't put them in myself. I didn't ee them put in. I didn't see the pistons after they were taken out of the car. I don't know what their condition was after they might have been run for a hundred miles.

Mr. Bruninga: That is all.

RE-DIRECT EXAMINATION by Mr. McCoy.

I saw the pattern from which the pistons that I have sketched in Exhibit 29 were made. That pattern was lagged up to get the right diameter for machining. I think that lagging was done at the foundry. I did not see the lagging after it was done.

The blueprint marked A-38 shows a valve sleeve in

the lower right hand corner.

Looking at Plaintiffs' Exhibit 31, one side of the sleeve is the intake valve and the other side of the sleeve is the exhaust valve. These sleeves would move separately. The double dotted line; extending longitudinally through the center of the cylinder sleeve is the slotted section of the sleeve. The sleeve is finished in one unit and then slotted. The units are not connected in any way after assembly. That is indicated by the dotted lines.

> Mr. McCoy: That is all. Mr. Bruninga: That is all.

Thereupon, the Plaintiffs called as a witness in re-buttal, Fano A. MULAINE, who, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Fred A. Mulrine. I am foreman of the motor assembly at Studebaker, South Bond, Indiana. I

live at 222 East 18th Street, South Bend.

I am acquainted with Mr. Edward J. Gulick and have known him since 1908. I worked in the same company with him from 1908 until 1914. I wasn't employed this company had gone into the hands of a receiver once or twice during that time, but I was employed with him all the time from 1908 to 1914 with the exception of about three months that I was in Findley, Ohio, in the letter part of 1913 and 1914. Pardon me, it was 1914 and 1915 I was in Findley, Ohio; the latter part of 1914 and the carry part of 1915 I was in Findley.

I think the name of the company, at the time I was working with Mr. Geliek, was Amplex Manufacturing Company. It was the Amplex Motor Company previous to that. After it went into the hands of a receiver it took the name of Amplex Manufacturing Company. My work with that company was service work, in the field mostly. I was acting as an automobile mechanic, taking care of trouble on the read or in the field. I traveled between Mishawaha and New York City, mostly.

I had notter experience urior to 1914, the nature of

I had motor experience prior to 1914, the nature of which was motor building, mostly. That was from 1906.

During the latter period of his employment with the

Amplex Motor Company, Mr. Gulick was busy developing another motor, I know that. It was a new piston, an aluminum piston, flexible or split skirt piston. However, I never saw that piston.

All I know about that piston is from hearsay in talking with Mr. Gulick, and that was sometime ago, of course. As I remember, he was developing a piston that wouldn't seize, with a flexible or split skirt. That is all I can recall regarding the structure, aside from the fact that after Mr. Gulick had built up this engine he called on me one Sunday morning Sunday afternoon to take a ride in the car with him, wanted to show me how it run, and he took Mrs. Mulrine and myself, and we went with him to Elkhart, Indiana, a distance of about 12 or 14 miles, and attended the races that afternoon, automobile races, that Sunday afternoon, and back, of course he talked particularly about the smoothness of this engine, running of this engine.

Mr. Brunings: I object to that as hearsay.

The Master: The witness has answered. I will let it stand.

(Narrative continued) I really couldn't recall what Mr. Gulick told me regarding the structure of the piston that was in that motor at the time I testified the ride was taken with him to Elkhart, aside from the fact that it was a piston that was going to eliminate chances of scoring.

Mr. McCoy: Direct examination closed.
Mr. Brunings: No cross examination.

Thereupon, the Plaintiffs called as a witness, in rebuttal, Barr E. ROCKHOFF, who, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Bert E. Bookhoff. I live at 73 Beaupre Avenue, Grosse Points Farms, Michigan. I am at present with the Detroit Steal Products Company, in charge of designing, engineering, development work. We make steal window such, automobile springs, and railway springs.

I am acquainted with Edward J. Guliek. I met Mr., Guliek prior to 1914; I saw him around 1912 first, would be my best recollection. I worked in the same company with him, at the Amplex Company, I believe it was the Amplex Motor Company, we called it. It was located on Burkett Avenue, I remember, right near the Lake Shore & Michigan Southern Bailway, in Michawaka, Indiana. I believe it was in 1913 that I was working at that company. I know in 1914 I was employed in Detroit, so it

must have been prior to that, I believe it was 1913. I was a detail draftsman at the Amplex Company, under the supervision of Mr. Frank Winchester and Mr. Gulick. That is, Frank Winchester was text above me and he was in charge of all designing. I was employed continuously during the time I was with the Amplex Company. I couldn't recall how long a period it was, but it covered a period of some morths; I couldn't say exactly now.

We were designing automobile motors at that time; the one in particular that I recall was a sleeve valve motor, there were other designs that we had worked on, but I particularly worked on this sleeve valve motor. I remember that the motor had a new type piston. I remember that it had the double split sleeves, I would oall them. These sleeves were operated by eccentrics. I remember those characteristics. And then it had this piston that we are speaking of, and a special type of aluminum head on it. Those features of it I could recall.

As I recall the piston now, it had a head which carried the rings, that is an upper portion, you might call it, which carried the piston rings. That was separate and detached from the lower portion. It was cylindrical in shape, and the only connection between the two was an indirect connection inside the piston from the head to the skirt, but this skirt was entirely separated from the head by a groove that was machined clean through the piston, and then the skirt of it in turn was flexible, was made flexible by a slot. That slot was just a saw slot, I suppose, put in with a slitting saw in the milling machine; it ran diagonally across the skirt. It went all the way through the skirt, that is from the top of the skirt across to the bottom. I am not exactly sure where the slot was placed with reference to the bosses of the piston. I recall the slot, it seems to me it was located in such a way that it came on the side at right angles to the pin, but I wouldn't be too sure about it. That is the way I recall the piston at the time.

The connection between the head and the bosses in that piston was what we call a rib, you might say. I can remember the shape of it because I drew it myself. And there were two of these ribs, rather I should say, and these two ribs also had the piston pin bosses cast right on them, so that these ribs performed a double function; that is, they performed the function of connecting the head with the skirt and providing an anchorage or

place for the piston pin bearing.

I couldn't just recall the exact conversation between Mr. Gulick and myself at that time. Of course I was thoroughly familiar with the reasons for these things at the time. Just whether he explained it or not, I don't remember the exact conversation, but we did have conferences around my board on that piston, the three of us conferred together. Of course I received my instructions as to how to detail it, and there were conversations aside as to the relative merits of these particular designs, and so on. I didn't take part so much in that myself; Mr. Winchester and Mr. Gulick discussed those more freely. I was just a detail man bat I overleard them all; I overheard a lot. We talked about the merit of splitting the skirt, and the merit of separating the head from the skirt, and things of that nature, they were talked about. When I first laid the piston out, it was designed for cart iron, on the detail drawing that I made. But it was discussed making it in aluminum. But the drawing I made I feel quite certain that this material I specified on that was cast iron.

I saw other drawings beside the piston drawing. There were many other details of the motor that I saw at other times, and other details I made, too. The company drawings had the title in the lower right-hand corner, as all drawings have; it wasn't characteristic of those drawings; we filled it in ourselves. In the lower right-hand corner of the drawings we always initialled the drawing, and put the date of the drawing, when we finished the drawing we would put our initial on, I would put the name of the drawing and name of the company.

I believe there was a title for this particular type of motor I testified about, although I can't say from memory what we put on there for title now, that has

I can't recall definitely whether or not these pistons were ever made up into metal. I know that various parts of the motor were actually made. I saw patterns for them, some of them, by which I can definitely recall it. I cannot say I definitely recall the piston pattern, but I know it was intended to go through, make all the patterns for the motor; some of them I can recall—the cylinder block and head, I recall of course because they were large pieces. That motor was not in use by the company at the time I was working on these drawings, that I know of I don't remember of it being completed.

Q. Were any pistons tested out by the Amplex Motor Company or by the personnel there to your knowl-

edge? A. I know pistons were tested out. I was not in the test department myself, I only know that by hearing

Mr. Bruninga: I object to the answer and ask it be stricken out.

(Narrative continued) I believe I could recognize my lettering and initialing, etc. on the drawings on which I was working at the Amplex Company.

That pisten was intended to operate like a cast iron piston would operate, that is, within a cylinder, in this particular case the inner bore of that evilinder was an inner sleeve, between which the semi-circular sleeve I spoke of before slid between this inner sleeve and this cylinder wall casting, and this piston was intended to reciprocate in this inner alcove. Now, if the operation includes the merits of that particular design, I know what they were contended to be at the time. The piston structure was intended to function in this way, that the head being attached to the skirt, the transference of heat would not be so great from the skirt to the head, and the skirt being flexible would make it possible to fit it with less clearance to the sylinder, in that way it could be made a better fit.

The piston could be fitted with less blearance to the cylinder because the skirt was split and there was flexibility. The skirt being cylindrical permitted it to flex; it would go like a piston ring. The inside structure of the skirt permitted that operation. These two ribs that went down were separate, there was no connection processage between them. The wrist pin was carried on bosses that were carried on these ribe in this piston. The bosses were cast on the ribs. I wooldn't say offhand whether the piston pin was anchored in the boss or whether it floated. The drawing will show it. I couldn't

tell you from me

Mr. Brunings: I want the record to show that up to this point there has been a regular display of split pistons before this witness (indicating exhibits which are on table beside witness).

(Narrative continued) (Witness examines blue-prints marked for identification as Plaintiffs' Exhibit 30). This (indicating sheet 1) is a blueprint of a crank-case. I remember that one distinctly because we had a lot of discussion about that. The drawing marked A-80 I can remember very well, all the lightening holes in the

main bearings and this wrist pin, lots of discussion about that, the oil throwing flange; this is Mr. Gulick's method of dowling on the flywheel.

Beferring to the lower right-hand figure of the drawing, I recognize that marking; I remember the "E. J. G. motor," the Gulick motor, which all of them had, and

Winchester's initialling.

I couldn't give you from memory the dates of the original drawing from which this print was made. All I know is I left there some time in 1914 and worked there prior to that time. As to dates, I couldn't tell unless I looked up some records. This drawing was made during

the time I was with the company.

The second drawing included in the group, marked "Plaintiffe" Exhibit 30, Crankcase plan view, sheet No. 1," is a drawing of the crankcase. The crankshaft was to run in these bearings. I can't say that I remember this tracing being made, but I remember the drawing being made. This blueprint was made of a tracing which was made from the detailed drawing on the drawing paper that I had, but I didn't make this one myself. I saw this drawing being worked on while I was employed at the Amplex Motor Company, but whether it was the tracing or the original drawing I can't recall.

I don't recall the third drawing in the same group, marked "Plaintiffs' Ethilit 20 Geor Cover." and in

marked "Plaintiffs' Exhibit 30, Gear Cover," so distinctly. I can recognize that belongs on there all right. Here are the two drive shafts, driving those eccentrics that came in there, and so on. I say I didn't work on all these drawings, some of these drawings Mr. Win-chester made them and I didn't have so much to do with them. I can't remember that. I evidently detailed it, my initials are on there, but I can't recall offhand. There is my initial right there. That is my lettering. For come reason or other, I care't remember actually making the drawing.

I remember that oil pan shown in the drawing of the same group of blusprints marked "Plaintiffs' Exhibit 30," and in the lower right-hand corner "Oil pan, sheet 11." It remember the discussion about it and the

double bottom, all right.

Referring to the drawing bearing the motation "Valve gear," that is the valve I spoke to you about, which slid like this one does, in two pieces; here is the two halves; there is the oil groove intended to keep the oil moving on the surfaces; these are the ports through which the gases pass; I can remember that. And then

these two holes here with a little lug fastened on to which the connecting rods were attached; they in turn were operated by this eccentric. I can remember them quite distinctly. I can remember making that drawing. There in the lower right hand corner is my initials, the date I put on there, which I always put on when I finished, and the "E. J. G. motor," and so on. All this lettering is mine; I did that all myself. I used to letter with the flat of a pencil; you recognize that, elightly flat of a pencil.

I have seen drawing marked A-2 of the same group. often. That was a profile picture of this E. J. G. motor.
I remember the drawing marked A-S. Those laid

around there quite a bit.

The drawing marked "Plaintiffs' Exhibit 31" was a cross-section of this E. J. G. sleeve valve motor, and this inner sleeve is the stationary sleeve, this is the outer wall of the cylinder casting, and these were the two semi-circular sleeves that alid between this sleeve and the cylinder casting. This is that lug that I spoke to you about that attached onto this semi-circular sleeve. Here are the eccentrice that operate the eleeve. I remember that distinctly, that drawing was almost all the time there for reference and used largely in detailing parts of the motor, for instance your eleeve, getting your dimensions, you would use this drawing. There are the ports I spoke of, the exhaust and intake ports. And this is the piston that I make of. That is the upper part that carried the rings; there is the lower cylindrical part I spoke of. Here are those ribe that attach to the skirt, and here attached to the head, there were two of them, one on each side of this connecting rod. This is the rib. Applying numerals to the different parts, we can call that head 1, for example; we will call this skirt 2; we will call this rib here 3. In this head 1 is the head I referred to that had the rings on; in this case it was a sort of composite ring, and that was the head I re-ferred to as being detached from the skirt, which is here marked 2, the detachment being accomplished by milling or machining a greave or slot all the way through at this point. You might call that point A. The only connection between the head and the skirt being these two ribs which were inside of the pister proper. The wrist pin was carried in that piston to two bosses, one on each of these ribs marked 3. As I said, it is evident now from this drawing it was anchored in the connecting rod and therefore must have turned in the piston

pin bosses. I recall this drawing distinctly. Here is your boss on the connecting red. There was a boss cast on each one of those ribs marked 3 here. Those bosses of course were machined out, probably reamed, and they served as bearings for this piston pin, or wrist pin, I

think you would possibly call it.

The fact that the piston was fastened onto the connecting red here by this clamp screw prevented it aliding in the direction of its length. The clamp screw (marked 4 by the witness), going through the bosses on the connecting red, tightening the entire red on the pin so that the pin was held stationary, laterally on the connecting red, therefore it couldn't slide off laterally

through the piston bose I recognize the blue I recognize the blueprint, marked B-3, quite distinct-That is the same piston. You will notice this is detailed right from that drawing. Here is your head again, with your groove to carry the rings. I would call this head portion I, skirt portion I, rib I would call S, I would call this bose 4. If there is reference to any other things we could number them as we go; but this portion here is the head, I refer to head I, separated from the skirt 2 by this groove. You will notice the finished marks or groove that was finished out, and the only connection between the skirt and the held being these two ribs marked 3; and you will notice there are two

ribe, you might call them 3-A and 3-B.

Referring to the right-hand view, you will notice the bosses that were cast right on those ribe. This is a cross section. You will notice this section is sectioned there, the bosses are those integral portions of the rib, being cast right on there. (Witness marks the numeral 4 where the bosses are.) The other ribbing in the head was to give it a little interal strength. There is a little rib in here, which I will mark 5, in this view, also. And then on the inside there was a similar reinforcing rim,

then on the inside there was a similar reinforcing rim, we will call 6. These were purely reinforcing ribe.

The reinforcing sibe were at right angles to the ribe that connected the head and the skirt. In other words, the reinforcing ribe 5 and 6 were at right-angles to the ribe 8, and connected the rib and the piston pin boss in such a way it formed a reinforcement. There was a means in that piston for inbrigating the wrist pin. The oil was supposed to be collected in this little groove here and carried down through this little tube that connected up with this boss. We will call this groove No. 7. This is marked there, identified "oil pipe 16" outside diagn-

eter." We might call that oil pipe 8. That was inserted. You see there was a little boss provided and drilled, inserted in there so the oil would flow through. The oil would collect around this little groove, marked 7, at the top of the skirt. The opening through which the oil was delivered to the boss was just drilled in there, as I remember it, a hole run up through here, and that little pipe connected up to that hole. I don't recall any lock pin to hold that piston pin in there.

The openings 10 in the bottom of the boss look as though they might have been for pins, I couldn't tell you now, my recollection is not clear. That opening is shown right there; that is the same opening. They look as though they were made for a pin. The oil hole 11 was drilled through from the little bess 12 on the wrist pin boss. That is the way the drawing called for. Here is your quarter-inch drill called for, and continued on through, the same center line goes on. Here is your ninety degrees. The purpose of this boss 12 I can't recall now; I can't tell you why that bees was there. I recall being instructed to put this oil pipe 10 in to earry. oil down there, but beyond that I don't remember now whether it was intended for that inbrication, to carry farther than that I don't know. It looks evidently that it was intended to carry through there. You could not form the oil hole at the top of the boss without forming the hole in the bottom of the boss unless you went through the head of the piston, which would not be very good policy. In order to drill all hole 11 you would have to drill hole 10. That accounts for the boss 11, in my opinion. We often do that, put a boss for the pur-pose of starting a drill, so you have a surface to start the drill.

In this particular case the boss is not clearly finished on that drawing. I imagine it was intended that the drill be started at right angles to the boss, ninety degrees. I would say if anything that was an oversight on my part in not bringing this line around here, the purpose of it being to have a point for your drill to start on. That is not possible of this job; it is well known to do that.

I couldn't tell you when the drawings, muched A-1 and B-3, and identified in ovidence as Plaintiffs' Exhibits \$1 and \$2, were made without sosing the date on the drawings, except that I know they were made prior to the time I left for Defruit which was some time in 1914, but I couldn't tell you from memory. The draw-

ings were made in that Amplex Motor Co.'s office on

Burkett across or near the railroad.

I made Plaintiffs' Exhibit 32 drawing myself; it has my initials. I actually recall working on the drawing on the board. We had quite a few conferences standing around the board on that job. Mesers. Winchester, Gulick and myself were in those conferences. In those conferences we discussed quite a number of things; the design of the piston, the thickness of the various parts, and the proper proportion of the ribs to get a good casting, how much to allow on there, and so on, and the width of the groove, things like that, all those things were determined by discussion. Winchester sould in the capacity sort of chief drafts-

man, and Gulick was the designer, and his word was al-ways the last word, of course. And in the absence of Mr. Gulick of course I took instructions from Mr. Win-

chester.

Exhibit 31 is one of Mr. Winchester's.

The piston shown in Plaintiffs' Exhibit 32 and the structure shown in Plaintiffs' Exhibit 31 are the same pistons exactly. This piston (indicating 33) is detailed from this layout (indicating 31). That is, the piston in 32 is a detail of the layout in 31.

I can't recall the actual making of the pistons at the Amplex Company plant during my term of employ-ment, because as I say, I worked in the drafting room and the work was done out in the shop. I remember the drawings more particularly.

The meaning of the term "E. J. G. motor" was that

E. J. G. were Mr. Galick's initials.

I always put my date on the drawing when the drawing was completed. Of course afterwards there might be a correction or so on the drawing, but when we made our detailed drawing and finished it ready for inspection of Mr. Winehester or Mr. Guliek, we put our date on and initialed it. I put the date on Plaintiffs' Exhibit 32 myself, when the drawing was finished, "6-

24-16," that is the date. I don't know where the original drawings are now, or where the original tracings are.

I am the Bert E. Boekhoff who testified in Interferences 49,569, 49,570, and 49,571 that involved this same piston structure; I don't remember the date, but I re-

My father's name is William H. Boekhoff. At the time I was employed at the Amplex Company's plant, he was the owner, part owner, of the American Castings Company; they made aluminum castings. That company was located on the Lake Shore & Michigan Southern Railroad and Burkett Avenue. That company principally made aluminum castings.

Q. Do you know of your own knowledge whether they made aluminum eastings for the Amplex Motor

Company?

Mr. Bruninga: I object to it as leading. The Master: I think he may answer that.

A. Yes.

(Narrative continued) I know the Amplex Company made pistons that went over into the plant of the American Castings Company. I can't recall any signed order, but we made pistons that were delivered over there.

Mr. McCoy: Direct examination closed.

Ches Examination by Mr. Bruninga.

Referring to the drawings, Exhibits 31 and 32 that I just examined, it is possible that there were bushings in them. If the wrist pin bosses were to receive a set screw, they would have been tapped; they weren't tapped. They aren't completed at the bottom; that is an oversight there. They should not be full across there. I don't believe that it was an oversight that I didn't put a thread in there, because it calls for a drill; it doesn't call for any tap there; it would have been a double oversight; then. I know that jige are employed to drill holes in castings of that kind. With a jig, a hole could be drilled; but it is always more convenient to have your drill start on a flat surface. The drill has a tendency to pull over if you don't. As a draftsman I usually did put a boss on a rounded surface that a hole was to be drilled into. Those are usually the instructions of the designer. to do anything like that.

Q. But it would be perfectly possible to put the bushing in those wrist pin bosses and plant them by a set screw and then drill a hole through the bushing in line with the hole 11, to bush those bearings; isn't that right?

Mr. McCoy: I object. I think opposing counsel ought to ask the witness for the particular structure before him before asking him what might or might not happen.

The Master: He is calling his attention to the drawing; I think the question is competent; he may answer.

A. That is possible there; you can clamp a bushing in any boss if you want to; but this hole is drilled clean through. It would be rather absurd to tap the bottom hole. You wouldn't do any more work than you had to. If you did have a tapped hole at the bottom you would drill through there, not merely for the tapped hole; you would only drill through as far as the hole you had to drill. If you did put a hole through at the top, you would drill through the same bottom hole; then of course this hole would be a tapped hole, and that one would only be drilled.

It was quite common in 1914 to bush east iron pistons. I expect I placed the notation "cast iron" on the bottom of that drawing; that was the material called for on this drawing for that piston.

We thought the thickness of 1/16" of the skirt wall

was just about right for east iron pistons of that size.

I made that drawing.
In my answer to Mr. McCoy's question with reference to Exhibit 31, the main cross-sectional view, wherein I said "like this piston that I spoke to you about," I meant when I was talking about this piston here on the

chair.

I don't know when I last saw that drawing. I saw it at the Packard Motor Company once. I saw it when I testified in the previous case. I don't believe I met the attorneys in that case until I came up there to testify; I can't recall talking to them. I have talked with nobody about these pistons in the last couple of months except to my brother, Alisle W. Rockhoff, telling him we were called down here. We both knew we were called down to discuss the piston. Of course he is not so familiar with it as I am. I told my brother that I was coming down here on this case and I supposed this was one thing—not to discuss the construction end of the piston; I didn't discuss the piston with him at that time.

The American Castings Company made aluminum castings principally; we made some brass castings, but

that wasn't our business.

I met Mr. Gulick about 1912. I couldn't recall definitely the date I met him, but we came to South Bend, as I recall it, in the latter part of 1911, and it wasn't very long after I became acquainted with Mr. Gulick through my association with the American Castings Company.

In the early part of my testimony, where I said "The piston that we have been speaking about." I don't recall that, but my brother and I talked about these pistons, said we were coming down here on this particular case, and, of course, we mentioned these pistons. wouldn't say we talked about this piston construction. My brother doesn't know what this is, the construction of it, from the design standpoint.

The piston I had in mind in my direct examination, that had an aluminum head, was the piston on that drawing there that had the aluminum head separated from the skirt; the skirt would be immaterial; it is all one easting.

In my direct examination I said "as In recall the piston now," but I never had any different recollection. Of course those things are so long ago you have to scratch your head a little bit to remember some of those things. In other words, when I saw these drawings of the piston Exhibits 31 and 32, they refreshed my memory, although I think I could have sketched the piston in genshed the piston in general even before I saw the drawing. I could have sketched that any time. I was not saked whether or not I could sketch that piston on direct examination.

I didn't see Mr. McCoy until I came into this room here. I saw no one except Mr. Edgerton, my brother and father; I just saw my father today, when I came to town.

Mr. McCoy: Let the record show that Mr. Edgerton is employed by the firm of Richey & Watts, of whom F. O. Richey is a partner.

(Narrative continued) I did not discuss this piston with anybody in Richey & Watts' office before I came

here, nor did I discuss it with Mr. Edgerton.

The people I mentioned includes all of the people I have talked to with reference to this piston in the last three or four months. Of course this pinton has been the subject of conversation among engineers for years. I might have talked to other people about this puston; that is evident; but I can't result any discussion relative to this case. I mean by that the subject of discussion among engineers themselves. All gas engine engineers talk about a pintpu like this at different times.

a, railroad fare, and so on are being paid on this trip, and nothing size. I got permission to come

down here; I simply laid off from work.

I didn't make that big drawing of the cross-sectional motor, but I made the little drawing, Exhibit 32. I wasn't. a lay-out man; I was only a detail man. I made the detail drawing.

Mr. Bruninga: Cross examination closed.

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RE-DIRECT EXAMINATION by Mr. McCoy.

I couldn't clearly recall whether or not the piston shown in Plaintiffs' Exhibit 32 was intended to have bushings in the bosses; but I would take it that it was, probably; pistons of that nature often had brass bush-

ings in them.

The wrist min 5 would be indicated in that crosssection of Plaintiffs' Exhibits 31 and 32, the part of the cross section that is typical. This cross-section shows the pin through the connecting rod, and of course the bushing itself is not clearly shown; the pin is shown; whether the bushing is there or not. I couldn't tell from this drawing. There would be one possible method of determining that. Knowing the size of this hole, and the size of that piston pin, you would know whether there was something required to fill up the additional difference in diameter. In these drawings, Exhibits 31 and 32 the wrist pin, from the fact that it was clamped on to the rod, was apparently intended to move in these bosses to oscillate in those bosses. That is additionally brought ont by the fact that your inbrication is carried to this point. There would be no need for set screws in the bosses on that piston, if it would oscillate. The set screws are always put in straight. There wouldn't have been any reason for that angle at all. It would have been much easier to put it on straight, on the center line, if you wanted just a set screw. There would be no bushings used in the wrist pin beeses if it were intended to clamp the wrist pin in those bosses by means of a set SCIEW.

Mr. McCoy: That is all.

Thereupon the Plaintiffs called as a witness, in rebuttal, William H. Booksorr, who, being first duly sworn, testified as follows:

Disser Examination by Mr. McCoy.

My name is William H. Boekhoff; age 69. I live in Cleveland, 6204 Clinton Avenue. At the present time my occupation is metal pattern maker with the Westinghouse Electric & Manufacturing Gompany, at the foot of West 58th and Bulkley Boulevard. My sons' names are Bert E. Bockhoff, the oldest one; Boland F. Bockhoff of Pasadena; and Alisle W. Bockhoff.

I know Edward J. Gulick. I met him somewhere around 1913 or 1914 at Mishawaka, Indiana. At that time I was running an aluminum foundry, called American Castings Company, and located on Burkett Avenue, alongside of the New York Central Bailroad, right opposite the Amplex Motor Car Company. Two of my sons worked with me in that foundry; Boland was in there some time, and Alisle.

When I knew Mr. Gulick he was across the street at the Amplex Motor Car Company. I knew him because he had some castings made at our place; and he came over there to see us several times in regard to the castings, which were aluminum piston castings. That was during the summer of 1914, I don't know just what date

or month.

Those castings were for just an ordinary piston, as far as I could see. I don't know that there was anything special about them that I can see on them; just straight wall. Mr. Gulick brought the pattern and core box over to the foundry personally for those castings.

I don't remember whether or not there was a receivership in connection, with the Amplex Motor Company around that time; there were several receiverships there; I don't remember just when they were; but I do

know there were receiverships for that plant.

I delivered those castings to Mr. Gulick. I saw those castings after I delivered them to Mr. Gulick, because he returned some of them after they had machined them, they showed some blow-holes, and we replaced them, several like that. I don't remember how many castings we made; several sets there; probably eight or ten; something like that; I couldn't say. There were more than one batch of castings made; I don't remember whether two or three of them; but there were blow heles in them, and then we would make good castings; they were just for replacement.

Mr. McCoy: Direct examination closed. Mr. Brunings: No cross examination. (Adjournment taken to the following day.) (There pon at 9:30 a. m., Thursday, February 2, 1933, the hearing was resumed.)

FRANK U. WINCHESTER, a witness called by Plaintiffs in rebuttal, who, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Frank U. Winchester; age 46. I live in Lansing, Michigan, 517 West Main Street. I am at present Sales Engineer for the Motor Wheel Corporation. They are primarily wheel manufacturers. They do contract stamping business and specialize in brake drum production. It has to do with antomobile accessories.

I know Edward J. Gulick. I first became acquainted with him in the spring of 1914. He had a job open for superintendent of design of a aleeve valve motor. Through Mr. Randall, who was connected with the Amplex at that time, they got in contact with me and made arrangements for me to come down there and go to work. That was at Mishawaka, Indiana. Originally that firm was known as the American Simplex; there was a conflict with an eastern concern; so I believe they changed the name, shortened it to Amplex; but that was long before I went there. My position at the Amplex Company at that time was chief draftsman. My supervisors there were both Mr. Gulick and Mr. Randall. That was, I would say, the latter part of April or first of May, 1914, but I haven't any definite record. I was with the Amplex Company until the time they went into receivership, which I believe was around some time in November, 1914. I haven't any definite way of placing the date of that employment. The only thing I can say; I know that I came from New York east with the Reo a short time, a week or two when Randall called me up and asked me to come down there. I know that was March. I was with the Rec only a short time, two or three weeks; then went with the Randall people. In connection with leaving, I do recall of leaving there to get married on September 15, 1914. I remember I was broke a short time after that; so I think that was November; the early part of November or middle of November; just about that time the deer season opened in Wisconsin and I went deer-hunting.

The alcove valve motor which Mr. Gulick was designing was entirely different from anything I had ever

seen before, in this respect, that it was a sleeve valve type of engine. The sleeves were, I might say, semi-cylindrical, half-round alceves; they operated at quarter crank shaft speed instead of half crank shaft speed, as is customary with the Knight type of engine. In this particular design the sleeves did not contact with the piston whatever; there was an extra large cylinder that went in from the top of the cylinder casting proper, and these sleeves operated between the cylinder the piston ran in and the water jacket or water jacket portion of the cylinder. There were two sleeves in this engine, the inlet sleeve and exhaust sleeve. There was an eccentric shaft on both sides of the motor; one operating the inlet valve sleeve, and the other operating the exhaust valve sleeve; I would say like a Thead engine. The motor was new all the way through; required a lot of study; the crank was peculiar to itself; and as I recall, there were seven bearings—I might be mistaken; the eccentric shaft was quite a job to design and properly timed, to get these parts to operate at the proper time, and the piston rings, that were used in the pistons were some-thing that I had developed and had been very successful with in moing a few years previous to that, and the piston itself was an entirely new design as far as I know. I recall the structure of the piston; it was separate, what you might call a separate head piston, the skirt was separate from the head. There were some of those heavy ribs ran down from the head of the piston to the piston bosses, and the return was a continuation of that, fied to the supporting skirt; that skirt was split in a diagonal line, probably about five to ten degrees, the idea being that we could fit the piston tight, or approximately size for size of the cylinder, and eliminate to a great extent the possibility of slap in the piston against the cylinder wall.

If r. Guliek proposed the design of that piston and I worked with him. He gave me a sketch of his on it, which of course, was a rough, free-hand drawing, and it then had to be worked out to as close as we thought could be produced commercially, and that was my job, to work that out and oversee that the drawing was O.K. The features of the piston that were worked out were the separating of the skirt from the head and the splitting of the skirt to take care of the expansion that normally takes place in a solid body. We believed the splitting of the skirt would eliminate the expansion of the

piston, causing the piston to seize to the cylinder. That is, we believed it would take up that expansion because the piston has to be loose. We put that slot in there to eliminate the possibility of the piston sticking in the cylinder and prevent slap. All of that information was disclosed to me by Mr. Gulick, and we worked it out to gether. In a case like that a man comes to you with a sort of free-hand sketch, which is not to scale or anything, and you have to take that idea and work it in with the design you are working up. It is more or less studying out the details of the design for that particular engine, and I say that was my job, to work that out, and we consulted on the thing a lot and made our ideas agree, and finally produced a drawing that was satisfactory to Mr. Gulick, and called it a day with that. The drawing or sketch that Mr. Gulick showed me was a free-hand sketch, usually what you get; I am sure that is what he gave me at the time, just a rough, free-hand sketch without any dimensions on it at all, just giving an idea of what he had in mind. I wouldn't be able to tell what character of paper that sketch was made on; I don't remember. I believe I would recognize that sketch if I saw it again.

We finished the drawings at that time, finished the details of the drawing, made details, so something could be made from the drawing; then later they were traced to make a permanent record. I would recall those drawings if I saw them again; I saw them being made. I supervised the men who worked on the details of all of this. I made some of the details; other people made other details. The piston was worked on by Bert Rockhoff. I don't recall whether Bert Bookhoff was there when I went to work for them or not, but he left a short time before I left; it might have been a mouth or two months before I left; it might have been a mouth or two

time before I left; it might have been a mouth or two months before I left, when he went, but I don't know. I had other drawings besides the detail drawing of the piston; we made assembly drawings of the motor; we made a front section through the cylinder, showing the valve mechanism, sections of the piston, and heads, and all that, and the sustomery front view section of the motor. I distinctly fecall making the assembly drawings, personally. I would recognize that drawing if I saw it again. I do not know where these original drawings are at the present time; I don't know anything about them; they were all left with the Ampler people, at the time of the receivership.

Q. You have stated that you could probably reproduce or make a drawing of the piston that you have mentioned in connection with those drawings. Now I will ask that you do that and take these pieces of paper and reproduce as best you can the character of piston that was disclosed to you at that time.

(Thereupon a recess was taken and the witness made six sketches on five sheets of paper.)

Mr. McCoy: The witness has produced a series of sketches marked for identification as Plaintiff's Exhibits 35A, 35B, 35C, 35D, and 35E, the figures being numbered consecutively from 1 to 6, inclusive, in the order in which they were produced.

(Narrative continued) Figure 1 of Exhibit 35A is a section cut through the center line of the piston showing the bosses that carry the piston pin, and these bosses that carry the piston pin are tied to the head with a series of ribs. In other words, they just hang down from

the head and tie to the head with some ribs.

The piston bosses 1, are tied to the piston head 2, by a series of ribs 3. The skirt of the piston, that portion below the head, is separated from the head by the continuous dut or slot which in turn is tied to the piston pin bosses. The skirt 4 is tied to the piston bosses, with ribs, as a means of supporting the skirt, carrying it up and down with the rest of the piston. The ribs 3P are at right angles to the axis of the wrist pin, and they reach vertically up to the piston head.

The ribs SP are shown running right straight across here (indicating on Figs. 1 and S). The ribs SP shown on this sketch Fig. 1 and Fig 8 extend across the piston from one side to the other. It is on this main rib that the piston pin bosses are tied to. You see, the ribs are together there, and they make a kind of T-section there; it is pretty hard to separate the ribs because they are not separated; to say that one rib does one thing and another rib does something else is rather confusing to me, because the ribs are tied together, making a T-section out of it, one rib reinforcing the other rib.

The skirt portion of the piston is tied to the piston bosses by ribe 7. Now, there is a rib right up in here that doesn't show, and it is awful hard to show; it is a continuation of this ris here, that comes over to that skirt and carries up there. I don't know whether you would call it a part of the rib 7 or whether you would call it a portion

of this 3. There is another section over here, you might-call—this is 3, 3P, you could call this rib ever here 3R. The numeral 6 refers to a slot in the piston skirt, 4. That slot is located 90 degrees around from the center line of the piston. I don't recall whether it was on the thrust side of the piston or not. The thrust side of the piston is that side of the piston which on the power stroke carries the load of the exploding gases, and on account of the connecting rod being on an angle and showing the piston to one side against the cylinder. There was only one slot 6 in that piston. The slot went all the way through the skirt, from the top of the skirt to the bottom of the skirt.

The numeral 5 refers to a slot that separates the piston head from the skirt. The indentation 8 at the top of the skirt was put there for the purpose of collecting oil in that groove, and that oil was collected in there, with the idea of leading the oil down through a pipe, marked 9, for the purpose of lubricating the piston.

As I recall, the pipe for admitting the oil to the wrist pin was inserted from the top of the hole 10 at groove 8, and extended down into a corresponding hole

Il in the piston boss.

Hole 11, shown in the bottom of the piston pin boss, became necessary because it was the only practical way to drill through this boss and also make this hole 10. (Witness applies corresponding numerals to other figures.)

The head of the Liston was smaller than the skirt of the piston to allow for expansion when the head was hot. The piston skirt proper, I would believe, would have been about ,002" under the standard cylinder bore. For instance, if it was a 3" bore, the piston skirt would have

been 2.998.

It was generally known up to that time that expansion takes place in pistons of internal combustion engines; those pistons have always had to be made up to that time rather loose to take care of the expansion, to prevent the piston seizing when the piston was hot. It was cold pistons to a great extent that caused what we called piston slap, when the engine was cold; and the thought back of this piston, expecially the splitting of the skirt and fitting of the skirt snugger to the cylinder bore, was to overcome the looseness that had to be incorporated in the other design of piston or the conventional design of piston, and the slot was primarily to take up the expansion of that metal caused when the piston skirt

would normally expend, which would create a certain load against the cylinder walls. This piston being a light skirt, we believed the skirt would sort of collapse or still fit the cylinder 4 at about the same fit as it fitted it when the cagain was originally assumbled. That was the

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) I don't recall that Mr. Gulick to nature of the material that he hat way.

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Mr. Brenings: I object to that as leading. r: He may answer.

A Tes

(Norveth)

taken from the original paper drawl would indicate the name of the man w the drawing; and in lots of ea, or the man drawings, and it would show his initials on the process the testing the last of the paper drawing of course, would be applied as ease as the paper drawing had been beautiful. The date on the tracing was all to include the paper drawing had been baked. The date on the tracing was all to include a later date then the original drawing was made. The planting of the date on the tracing of course, when made they been provided drawing as a seal of the date of the tracing of the date of the tracing of the date of the tracing of the course tracing was made to the tracing of the course tracing was been dated. It where course the made a provide the they will account the many realisable to make a tracing the tracing would be dated. I do not have the tracing the paper drawing the tracing would be detect. I do not have the tracing of the original drawing the tracing would be detect. I do not have the tracing of the original drawing dated and the tracing would be detect. I do not have to the tracing of the plant on the tracing of the plant of the date that the tracing of the plant of the date that the tracing of the plant of the date that the tracing of the plant of the date that the tracing of the plant of the date. The date that the tracing of the tracing would be detected by the date that the tracing of the tracing would be detected by the date that the tracing of the tracing would be detected by the date that the tracing of the tracing would be detected by the date that the tracing of the tracing would be detected by the date that the tracing of the tracing would be detected by the date that the tracing of the tracing would be detected by the date that the tracing of the tracing o

Exhibit 35 is a drawing, not a treating. A traving might have indepte date on it. You can't biosprint or that

The Mariet: I understand the difference between a tracking and a drawing. A tracking is on a piece of cirtle a piece of transparent cirtle.

The Witness: Lete of these there was a date on that, showing when the drawing was made and the date when it was traced

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I recognize the biograph marked "Plaintiffs' Ex-

showing the sleeve mechanism, a section through the engine showing the sleeve valve mechanism, piston construction, eccentric shaft, erank shaft, location of oil pump, method of distributing the oil over the crank shaft. I made this drawing before the details were made. That was made probably in June or July, 1914, at the Amplex Motor Company at Mishawaka, Indiana. This is the drawing that I referred to earlier in my testimony as

being a front sectional view of the engine.

As to the numerals on the drawing, 1 indicates the head of the split skirt piston; 2 represents the skirt separated from the head of the split skirt piston: 3 represents the ribs tying the piston pin boss and the skirt. Evidently this design of rib continued up to the piston head. 4 represents the capecrew used for clamping the piston pin to the connecting-rod, the piston pin being free to rotate in the piston, in the piston bosess. I don't know whether that "A" refers to the split in the skirt or whether it refers to this little relief here that we made for catching the oil; I think it refers to this little groove here for catching the oil, (indicating oil groove at the top of the skirt). And it was from this groove that we carried oil down through the small brass or copper pipes

to the piston pin boss for inbricating the piston.

The blueprint marked for identification "Plaintiffs' Exhibit 32," detail of the piston, is a copy with de-tail dimensions on, of piston shown in this Exhibit 31, and that shows ribs referred to in the previous testimony tying the piston head to the piston pin bosses, and it shows a slot out at a point just below the piston pin to n pin to coparate the skirt from the head; I mean be ow the pi rings, to separate the skirt from the bead. The other sectional view is at right angles to the pisten pin, (referring to the left hand figure of Exhibit 22). It shows the ribs that came down from the hand to the pister base going down to a rather small section and then spreading out to grab and stabilise the pister skirt. This pister detail also shows an enlarged view of an oil groove just at the point of the separation of the pister head and the skirt. This is the separation of the pister head and the skirt. This is the groove that hes been referred to in the previous remarks that collected oil which in turn was carried down through a copper or a brass pipe and the holes drilled in the wrist pin bosses of the piston for inbricating the piston pin. In these piston pin bosses the section of the drawing, at the right hand side, shows holes drilled through a boss which continue up through the, you might say, the top half of the piston pin boss. I

am sure the reason of the hole being in the bottom here was because of inability to drill the hole in the top of the piston pin boss from any other point. When the piston pin was assembled into the bosses, this hole was naturally covered up, the hole coming down here and lubricating from the top of the hole. I don't know what this 4 is. but this is 11, and naturally because of the way the ribs are put in the piston there, the holes had to be offset at a little bit of an angle to keep from cutting the heads out, from drilling them through. The numeral 10 is applied to the hole in the bottom boss. I don't know what that hole is there for. It occurred to my mind that we didn't make this pipe go into the hole in the top of the piston pin bosa; all the pipe was, was just sort of a drain pipe to supposedly let the oil drip into there to lubricate the piston pi

I don't know what the numerals in pencil at the bottom of the right hand view of the drawings 3A and 3B are, but I would say they rafer to the rib that, in the left hand view, comes down from the cylinder head and ties to the piston pin bean, and then goes over to the piston skirt to tie the piston skirt to the piston with here

I spent considerable time on the drawing of these details. This was gifte a new proposition and there was a lot of praverantion before anything was done on it. I wouldn't attempt to my how much time was spent discussing it is appears there was time enough spent on the thing to get the idea through my next.

(Thereupen adjournment taken to 1:30 p. m. of the same day.)

(Narrative continued, permane to adjournment) An inspection of Philatiffs' Exhibits II and II has refreshed my memory with regard to Philatiffs' Exhibits ISA, B, C, D, and E, as far as design of this particular ribroterroit to as No. 7 is consecrated. I just don't remember how that rib came around in it, and that is what is different between this should call the deswing, as far as I can see. This rib, I, also the from the picton pin bose to the skirt, but in a different position than the rib on the exhibit that I naw.

Q. Which is the position of the rib 7 as you saw it in 1914, as you recall?

Mr. Bruninga: I object to that, your House. These two are collectly unlike—it is a rather possilar question to sak this witness at this time.

Mr. McCoy: Well, the witness has testified that the drawings refreshed his recollection.

Mr. Bruninga: It is also true that he did not

make the drawing, Exhibit 32.

The Master: The drawings speak for themselves, don't they? I think that is objectionable. The witness has drawn this from his recollection as he now recollects it. He then goes to the drawing and sees something else. You can't change his recollection. You have put his recollection there, and I don't knew how you are going to meet that situa-

Q. Will you again refer to Plaintiffs' Exhibit 32. the bineprint, and tell whether or not you saw that drawing being made?

Mr. Bruninga: I object to that an leading.

Mr. McCoy: The witness has identified the initialing at the bottom of the drawing.

Mr. Brunings: Why shouldn't be identify the initials when he knows what these initials mean?

The Master: Suppose he did see it being made?

Mr. McCoy: Trying to prove the authenticity.

The Master: Well, he has already unawared as to that print, and the other witness testifled as to that

The Witness: Yes, I supervised it being made.

(Marrative continued) The man that made the de-tail of that drawing, Mr. Rockhoff, was responsible to me, and I hopt him in work in that organization. 'I didn't tall him what to put on the drawing; he worked from the lay-out, and I made the lay-out personally.

Mr. Brunings: I would like to interpose an ob-jection unless the lay-out in produced.

Mr. McOoy: The lay-out is shown as Exhibit
31, and is the lay-out.

Mr. Brudings: Of course I want to object to
that as being secondary evidence; the original has
not been produced and it has not been shown it is
lost, except by the witness, who turned them in and
dloss? I know mything about them since.

(Narrative continued) The dimensions that appear on this drawing, Plaintiffe Exhibit 32, were determined by common practice relating to the expansion of metal in a heated cylinder. I determined the limits on the

details of the piston. Probably Mr. Gulick assisted me in determining of the dimensions of the piston shown in Exhibit 32, from time to time; I don't recall that he laid

down any straight law on it.

In making the lay-out and drawing, Plaintiffs' Exhibit 31, we know the bore and stroke of the engine Mr. Gulick wanted designed, and having that information, and our past experience connected with motor design, the balance of the information was worked out from past practices together with information Mr. Gulick had that he wanted incorporated in the design.

Mr. Gulick gave me a sketch, or free-hand sketch, showing the general idea of what he wanted in the way of

a piston.

Q. I show you a/paper

Mr. Brunings: Just a minute before you show that to him. This witness, I am quite sure, stafed recently that this particular sketch, these particular sketches 35AB, were developed in accordance with instructions given him by Mr. Guliek, and my position is that that sketch, that I have seen before, this proposed exhibit that counsel wants to put in now, deviates considerably from them. I den't think counsel have the right now to do any more with that exhibit than what he couldn't do with Exhibit 32.

Mr. McCoy: May it please your Honor, this witness has testified that Mr. Gulick gave him sketches from which he made up his pisten lay out and typified in Plaintiffs' Exhibit 31, the general view, the details of which appear in Ethibit 32, and I am asking the witness now whether or not he recognises personally the sketch that I desire to show him for identification, Plaintiffs' Exhibit 36, whether or not that was the sketch shown to this witness by Mr. Gulick in 1914 from which there drawings were made. It appears to me to be perfectly competent. These sketches 35A to E are the sketches that represent the recollection of the witness when he entered this court room. They weren't the sketches from which the witness made up the drawings that were made by him and under his supervision that he has testified to in connection with Plaintiffs' Exhibits 30, 31 and 32

(Further argument had between counsel.)

The Master: I understand they are contradictory, if what is said here is true, but it seems to me they are properly in this case, and the contradiction can be examined about or relied upon. If this paper, which I assume it is so claimed, was present at the time or he had it before him when he made his first drawings, it seems to me that is competent. I think I will let it in and you may save your exception. I think it may go in, taking the case as I am, as a Master, for that may be a very important question in the case, something the court should have before it in passing on this case, and I don't want to take the responsibility at this time of excluding it. You may have your exception. It is received over your objection.

(Narrative continued) It is my opinion that Plaintiffs' Exhibit 36 is the sketch that I worked from in the design of the piston for the Gulick sleeve valve motor. I probably saw that paper, Exhibit 36, for the first time when I went to work there, at the Amplex plant, when Mr. Gulick explained to me what the engine was all about. I would say in the spring of 1914. Mr. Gulick gave me no other information to work from in connection with the drawing of the piston, that I recall.

Q. Was the drawing that you have examined, marked Plaintiffs' Exhibit 36, the only information received from Mr. Gulick in connection with the design of the piston for that motor?

Mr. Bruninga: He has just answered that that is all the information he had. Now counsel is trying to dispute his own witness.

Mr. McCoy: I am not disputing the witness.

The witness knows what he is talking about.

The Master: I think as long as he has answered I will sustain the objection and let him offer to produce it, and let it be included in the record so that the court will have it.

(Further argument had.)

The Master: I will overrale the objection and you may have your exception.

(Narrative continued) That is not all the information that I have had from Mr. Gulick. In the process of the design of a motor of this type that was very new, the matter was discussed from time to time, and may be discussed one week and then again at some later time. There is no question in my mind that the discussion of the whole job lasted over a period of three or four

months, and is that time I probably was instructed more than once about details of the type of the engine, including the piston or any other detail. All the instruction that Mr. Gulick gave me was practically all verbal; I don't recall whether I had written instructions or not. I won't say I didn't receive written instructions.

I don't believe I would recognize Mr. Gulick's hand-

writing at this time.

Bert E. Rockhoff, who worked under my supervision at the Amplex Company, had a brother working in his father's foundry across the street, in Mishawaka, at that time. I don't recall his brother's name. In addition to Mr. Rockhoff, I had a man by the name of Middleton, I believe, working under my supervision at that time—that is all I can remember.

At that time, the other people working at the Amplex plant, that I remember, were R. W. Randall, who I believe was supposed to be general manager, factory manager; there was a man by the name of Byerley, who was a tool engineer. Now, there was a man by the name of Mulrine, Fred Mulrine, who did what we would call outside testing, building up a chassis in outside testing work. A man by the name of George Young, who was a kind of general, all-around man at that time; he mounted bodies on the chassis and sort of finishing-job man, getting it ready for the road. I am afraid I don't recall any other names.

We had a tool room in a corner of the shop, a small one; I suppose there was someone in charge of the tool room; I don't recall who he was. We had a stock room out at the back end of the plant. The only fellow I know in charge of that stock room, as I recollect, who I think was named Brown. I couldn't say as to whether or not his name was Ed Hoadley. A man by the name of Johnson was the tool room foreman at the time I was there.

As to Plaintiffs' Exhibit 32, the detail of the piston, as the design and lay-out was started before I went there and I finished up the lay-out and I left there in November, and this work was all carried along in the same time, I can't check up the length of time that particular detail was worked on or any other detail. I was thoroughly familiar with that piston structure at the time I was supervising the preparation of this drawing.

Q. And yet you were unable to recall the exact piston structure when you were asked to make a drawing in accordance with your present recollection. A. It is twenty years now.

Mr. McCoy: Direct examination closed.

The Master: When did you go to work at the

The Witness: I went to work in either April

or May of 1914.

(Thereupon adjournment was taken to the following day at 9:30 a.m.)

Choss Examination by Mr. Bruninga.

I came to the Amplex in the spring of 1914. I had had experience in automobile manufacturing, or manufacturing of parts of automobiles before that. I did not keep track of all the automotive magazines. I read magazines. I did keep track of "The Horseless Age"; that was a popular magazine at the time. I don't know whether or not I subscribed for that magazine at the Amplex Company that year.

I did not see the article in The Horseless Age of April 8, 1914, Exhibit 4-M, the Herschell-Spillman crosshead pisten; this is the first time I have seen that article.

In Exhibit 35-A, Fig. 1, there should be a line at the right corresponding to the line directly opposite the arrow on the lead line 5, the same kind of a line. As a matter of fact that rib 3-R should have been moved over on the sketch. Those are for the insertion of the wrist pins. It is my recollection that the webs 3-R and 7 are interrupted at the point opposite the holes, but they actually weren't that way; that is a continuation of this rib here (indicating). It say that because of the sketch I saw yesterday; that changed my recollection. I wouldn't say it is not like Exhibit 35 at all; it is not like it in that you have only one rib 7 below the wrist pin boss, or a single web construction below each wrist pin boss. (Fy web construction is meant webs extending practically across.) My memory is a little faint on that.

practically across.) My memory is a little faint on that.

I saw that drawing, Exhibits 31 and 32, last in 1926.

The occasion for that was Mr. McCoy, I believe it was Mr. McCoy, took a deposition of me in connection with some other patent litigation, some other concern. I didn't actually go on the witness stand then, but I was shown those drawings and expected to be called as a witness then. I looked the drawings over thoroughly atthat time. I did not see those drawings before this secsion, the last time, I believe, being in 1926. I didn't expected, the drawings them as prints I was familiar with. This Exhibit 35, the draw-

ing that I made, was my recollection of what I thought it was in 1914. I didn't think of what I saw in 1926. I tried to recollect what I knew in 1914. When I made this sketch, I never thought about what I saw in 1926. It escaped my memory that I had seen those drawings in 1926, but the minute I laid my eyes on those drawings in 1926, but the minute I laid my eyes on those drawings in 1926, but the minute I laid my eyes on those drawings in 1926. I looked at my initials on the lower right hand corner of the cross-sectional view, Exhibit 31, and recognized them. I wrote my initials in the regular way; they are written in my own handwriting. I am very positive that that Exhibit 31 is a blue-print of the drawing that I made, that is, the large cross-section.

On my direct examination I remembered all the other details of the particular way that those valves were made on that engine, the two valves instead of being in one piece, two half pieces sliding, I remembered the crankshaft, I remembered the eccentric shaft, and I even remembered the piston ring, before I proceeded to make this sketch. I couldn't reproduce them in detail from memory, but I could have reproduced them in general

I remember having made this cross sectional drawing, Exhibit 31, because that is the only thing I worked on when I was at the Amplex. I made that particular figure because my initials are on the corner, and I remember what I did there. I also remember what I did as far as the piston is concerned, the exact structure as shown in those two drawings. I didn't make Exhibit 32, the piston detail; I made the lay-out, showing the section. Exhibit 31 is the lay-out, the long view.

The connection between the head and the wrist pin on Exhibit 35A is very close to that as shown on piston B, but the connection to the skirt is not the same. When I made sketch, Exhibit 35-A, I didn't remember just how the wrist pin bosses were attached to the skirt, but I did remember the detail of the oil tabe going to the wrist pin bosses. I also remembered the detail of the groove 8 at the top of the skirt. I said that I wanted a snug fit of the skirt into the piston, but free enough to slide up and down; I did not say that a snug fit was one that had about 1002" clearance, a snug fit is size for size, known as a ring fit. A ring fit and a snug fit are practically the same thing. I think you can slip a ring fit in easy.

There are three kinds of fits, a tight fit, a loose fit and a snug fit. A tight fit is usually referred to as a press

fit. The .002" clearance was my idea of what I might say was a snug fit for that diameter piston; in other words, it wasn't a sloppy one.

When I said that initialing drawings two months to a year after the original drawing was made, I referred to

general practice, depending on how busy we were.

In referring to the cross-sectional layout, Exhibit 31, I referred to the ribbing attaching the piston head to the bosses when I said: "This design of rib evidently continued out to the piston head." I don't remember any particular reason for using the word "evidently."

I think I will correct myself on saying that a man by the name of Middleton was at Amplex at that time, because I think Middleton left before I went there in

1914. I am uncertain whether he was there.

Mr. Gulick was at Amplex when I came there, in the spring of 1914. He made arrangements for me-to come

there.

I thought there was another man, an additional draftsman, there outside of Rockhoff. I was trying to think whether there was or not. I recall Bert Rockhoff very plainly. We didn't have very many draftsmen, and I am not certain whether we had others or not.

Both Mr. Gulick and Mr. Bandall got me to come to

the Amplex Company.

When I said I was chief draftsman, I meant I had supervision of the drafting department, regardless of

how many there were there.

Mr. Rockhoff made the detail drawing, Exhibit 32, from the lay-out, Exhibit 31, together with instructions from both Mr. Galick and myself. Both Mr. Galick and I gave Bockhoff instructions, how to proceed after we had given him the lay-out.

002" clearance in a cast iron piston was a pretty close fit for a piston. Perhaps there were pistons being

need that had a .002" clearance, I don't know.

I have been in Cleveland on this visit since Tuesday morning, January 31st. If have not talked with any of the attorneys in this case, about this case, except as they have notified me to come down here. If have not talked with anybody else about these drawings since 1926 until I came here to testify. I was shown those drawings in 1926; I recognized them then and I again recognized them today.

My expenses here have not yet been paid, but I have been promised my expenses. I expect to obtain something for my services here, but I have made no definite arrangements; I don't know what to charge, I have been

kind of mulling that over.

I am now employed as sales engineer for the Motor Wheel Corporation, working on a salary. I have been gone since Monday night, and I am being docked while I am away. I expect to get at least what I am being docked, but would like to get more, but I have told no one connected with this case about that. I understand I am going to be compensated for loss of time; I have that in a letter from the attorneys in the building downtown, but I do not have that letter with me. I think that is no more than right that I be compensated for my services, time and expenses while I am away from home. No honest man would let that affect the truthfulness of his testimony. Engineers like to be compensated for their time.

Mr. Bruninga: That is all.

RALPH MURPHY, a witness called in rebuttal by Plaintiffs, who, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

By Mr. McCoy: Before I examine this witness is it all right with you, Mr. Brunings, if we let the record show that the pistons and drawings were covered up for the witnesses Randall, Bert E. Rockhoff, William Rockhoff, and Mulrine?

messes they were covered up on both sides, except

of course Mr. Speliman and Mr. Jeffries.

My name is Balph Murphy; age 55; place of residence Syracuse, New York. I have no compation right now. My last previous occupation was vice president, H. H. Franklin Manufacturing Company. During the period of 1913 to 1920 I was chief engineer. Previous to that, various positions in connection with engineering. Subsequent to that position as engineer, manufacturing and asias.

Subsequent to that position as sugmeer, manufacturing and sales, general business outside of financial.

The Franklin Manufacturing Company maintains laboratories for testing of engineering problems, under the supervision of the chief engineer. They were under my supervision during the time that I was chief engineer for the company. Reports were kept of the activities of those laboratories. These reports were weekly reports turned in every week, which kept a running account of various activities during the proceeding week, and then

there were occasionally special reports covering some special subject. The purpose of those reports was to supply information to various people and to also enable myself and the parties with me, to bring special facts to mind, if you would read the report some fact might come out that you might have overlooked.

During the period from 1915 to 1990, in general,

there were three people prepared those reports: Mr. Forsythe, Mr. Williams and Mr. Stellman; there might have been a few reports by someone else, but those were

the main three.

The new things that came to the Franklin Company during the period 1915 to 1920 were submitted to us, where they were as a rule discussed and gone over. If we considered them worth while, we would go ahead and test them out.

We had quite a few problems of various kinds that we were testing out between the period of 1915 to 1920. During that period the main problem was pistons, outside of that there was what you might call a misetilaneous assortment of minor mechanical problems, but that was the major problem.

I had a great deal of test work done under my super-vision on pistons during that period from 1915 to 1920. We tested! I see called Long piston. The first Long pis-ton that was submitted to the Franklin Company was an aluminum alloy piston with four vertical and one hori-sontal slot in the skirt, and with an internal web at right angles to the wrist pin running down one side of the pis-ton, being out off, but not extending down the other side. The rib was arranged at right angles with respect to the wrist pin bosses; it didn't touch them, it ran up the skirt toward the head, at right angles, half-way between.

I have commined the Frenklin mechanical reports recently with respect to that pisten. There were stravings that showed that type of pisten, but I haven't got than with me. (Commit shows photostat P.3012 Plaintiffs' Riblidt 42 to witness). Yes, that is one. /The first test we made of pistens of the thansacter that I have just

described was in July of 1918

Mr. Brunings: I object to this paper produced Mr. McCoy: Well, the witness has described

the atructure.

(Narrative continued) I do not know where the original drawing is from which this print was taken. I

don't know that that is the drawing of the original piston, but the original piston is that type. By "type" I mean the things I have mentioned, that it has these four vertical walls, those two there, these two here, and this one horizontal, and this internal ribbing down one site and not down the other side. In regard to the slots, that is prelly much a matter of memory. In regard to the rib, that is partly from my memory and the record of the test men.

I can't say when I first heard of Mr. Long. He was a dealer there. The first I heard of pistons that Mr. Long was offering to the Franklin Company was in the spring of 1918, April or May; I think probably it was

in May.

Mr. Long wrote Mr. H. H. Franklin, the president of the company, that he had some piston ideas and development that he would like to take up with us, and Mr. Franklin replied and told him that of course we would be glad to know whatever he had and the best thing to do would be to said us a sample or some descriptive matter, or something like that, and I believe Mr. Long replied to him and then after that, these letters, or the matter was referred to me, and I wrote Mr. Long and asked him to send us a sample of the pister he was talking about. We get a sample make as we requested. It was the type I have just described to you, of the type above in photostat marked P-2012. I have recently even the original letters referred to by me. I can produce them. (Witness does so.) Here is Mr. Franklin's letter. (Witness does so.) (Witness does so.) Here is Mr. Franklin's letter. (Witness produces a photostatic copy of a letter dated April 17, 1918, addressed to E. C. Long, and signed by H. H. Franklin, letter being written on the stationery of the Franklin Automobile Company.) Here is the letter I wrote, dated May 9, 1918, addressed to Mr. E. C. Long, and signed by R. Murphy.

At the time of the writing of those letters, we were experimenting with pistons right along, and were anxious to try out new piston structures. We had been experimenting for some time prior, which work was practically continuous during that period. We experimented with pistons in 1916.

Mr. Long submitted another piston of a different construction to us in March, 1919. The characteristics of that piston, that differentiated from any other we had, as I remember it had six vertical alots, two horizontal alots, and internally there was a web extending across each wrist pin bees and at right angles out to and integral with the skirt.

Beforring to Long Patent 1,872,772, that is the type of piston Mr. Long submitted to us. In March 1919 we put a set of these pistons on an engine and run the test on the block with it; it wasn't very satisfactory. A eet was put in a car and run on a road test by Mr. Stellman; I believe Mr. Long was with him. During this first test

the piston set up, from the cylinder.

The very first test in 1919 of a piston shown in the photostat marked P-2912, the platon from in the cylinder and was pretty badly damaged. The first sample was one piston. We continued to test those pistons through 1919, whether and to what extent we did in 1920, and

aryond, I don't recall.

I don't remember any other piston structures different from the piston structures shown in photostat P-2912 and the patent 1,872,772 during that general period, up to the time stated, March 1919.

I don't remember Mr. Long submitting any changes in the piston shown in patent 1,872,772, though I have no doubt but what he did submit changes.

Mr. Bruninga: I move that answer be stricken out.

(Narrative continued) I would recognize copies of the reports of the tests made at the Franklin Company.

Q. I hand you a series of papers. Will you tell other or not any of these reports that are handed to you relate to piston tests made under your expervision?

Mr. Bruninga: Before the witness answers the question I would like to have it shown what he knows about the tests, unless they were made by

him personally-

Mr. McCoy: Well, this witness has testified the tests were made under his supervision. He got these reports made to him at the time the tests were completed, and they kept him informed of what was going on in the laboratory.

Mr. Brunings: Let's see what he knows about

these particular ence; that may all be. People are these particular ones; that may all on Propie are sick countined for two weeks; you are putting a lot of papers in his hands.

The Master: You want to examine those papers

before he testifies?

Mr. Bruninga No, I don't want to say that.

(Narrative continued) These are reports that were submitted to me. Here is a piston report of October 5, 1918, the tests of which were made under my expervi

(Reading from report) "MLSOM" is the head he particular test called "Plates andurance re rings—1 ъ. ceived. It may not on they were rewas four oil holes in the top of each wrist pe also eight oil holes just below the lower ring rine, thus be ine, thus built up, was pipeed on dynas itted with tinware, as in a car, and the ter est according to the method described in MLADM, so that recalls are comparable with these in that report. If this last test the pistons were installed in each a way that the ribless side was toward the ext e of the engine. The result: after ten minutes renaing, pistees 4 and 6 ested on the exhaust or ribber side of the piaton. This test will be repeated with the same style of piaton having a straight side skirt character of ANS and having ribbes side of piaton toward the sustion side of engine. To build up the motor in this way and not be obliged to cut away the rib in order to make room for the con-accting red cap cores, the connecting reds will be turned and thus have their cap serew on the suction mide."

This report was prepared by Mr. Porsythe. That re-port relates to the first Long type pistes that we re-ceived. That pistes structure is shown in Photostat Ex-hibit P-1912. I find in this exhibit the four oil holes in the top of each wrist pin been referred to in the re-port. I would say this point above 16 billes just below the lower time. the lower ri

Here is the rib R I spoke of that extends from the right-hand side of the plan view of the piston structure, over across the top and down to the plate dide, but on the one side it down't come down here; it is out off at the top. (Witness marks drawing with letter "S" to indicate rib.)

The report marked July 10, 1918 contains a reference to report marked July 10, 1918 contains a reference.

ence to pleton tests. This test is headed "MLSON."
Piston endurance runs. A regular series nine engine "Pieton es was equipped as follows: (a) The new production

Applies the white we make a reported as follows:

(SLAT SAPE with the last of the last was complend 4/20/10, and the following part married for
year 1—1 will also down to where it state about the
plane. The last partial parties, with finaling was
plane to the last plane broker it 100 will need the retriving sature and write pin bloc had all world betriving sature and write pin bloc had all world betriving sature and write pin bloc had all world betriving sature and write pin bloc had the write pin both
which the last was the last with the broken the
plane and the recovery. The rest of it is show
cylinders and valve liften. The date of that report is
lay 1 1919. Here is a further volunters to pinters. It

#35,509 -type 'B.' 250 of these from pattern X-13 are on order at Walker M. Levett Company. To date 14 of these have been duly received. We are advised that shipment has been made of an additional 50 eastings." The next paragraph is "Type (A). 160 contings have been received of our original order calling for 350 eastings from our type 'A' pattern #P-3912. After receiving 65 castings we receiled pattern back from Walker Levett Company, this to enable bringing pattern up to latest blusprint; Upon completion, same will be returned them for the completion of our order."

This report relates to Type A and Type B pistons. Type A differed from other pastens in general in that it had four vertical clots and one horizontal slot and an internal rib extending down one side of the piston and not down the other. And the Type B piston was one in which there were six vertical slots and two horizontal slots with each wrist pin bees supported by a cross rib extending to the skirt and integral with the skirt.

Q. In other words the Type B is shown in the Long patent 1,672,772, is that correct? A. It is that type, it is ment has been made of an additional 50 castings." The

ent 1,872,772, is that correct? A. It is that type, it is not that pisten.

Mr. Bruningn: I object to that entire question as leading, particularly as to the type A. I don't think that the witness has identified that print as the type A.

(Marrative continued) There is one further refer-te to the picton here. The next paragraph is "Ship-ets. 6 Long potented pictons, Type A equipped with an and wrist pine here been forwarded to our Detroit aler, Mr. W. J. Doughty." The date of the report are been forwarded to our Detroit registy." The date of the report trusts have been taken in May 3.

in 1917 you might re through, out type or another ring title on plat

During 1917 most of our experimental work was con-med to our regular production type abunium piston we are using in production. Outside of that I day't know I out result specifically what piston we were experi-mentally with

timested with out iron pistons. We experi-the Waisweight pistons. I don't know that mented with the Wainveright photon. I don't know that we were during 1917 especially, but we experimented with these pistons. Of course there were various others.

there were composite pistions, there was the Zephyr. what we call slipper piston, and Zephyr piston. In 1918 the tests were carried on practically continuously. The same thing applies for 1919. I would say 1918 was probably a little bit slower than the other years because we were doing a lot of war work and we had to use the times available.

These reports containing the subject matter that I have testified to were all made to me either on or nearly

the date shown on the report.

Mr. McCoy: We will put in photostats. Mr. Brunings: You offer them in evidence? Mr. McCoy: Yes, I will offer these in evidence as Plaintiffs' Exhibits 42-A. B and C.

Mr. Bruninga: Of course I object to the evi-

dence contained therein as hearsay.

Mr. McCoy: I mark the photostat produced by the witness, referred to as bearing the number

P-2012, as Plaintiffe' Exhibit 43.

Mr. Brunings: Of course I object to 43, being a setostat, not the original, the original not having sen produced, and it has not been shown that the original is lost.

Chose Examination by Mr. Brunings.

I must have been chief engineer of Franklin from about 1913 to 1920, approximately. I do not know in what month I was presented in 1920. My impression is it was in the spring of that year, but I am not certain. Mr. Stellman followed me as chief engineer. Louis Stellman, who is in this room. Mr. Stellman's job at that time was assistant engineer. His duties were as assistant to the chief engineer, and as such set, carry on all the engineering processes. Mr. Stellman wealth do some directly, he would do some directly. He had something to do with the piston development. He was in rather close touch with it. I would say be did more work on them than I did, but I don't think he was in closer teach.

I can't say when I first met Mr. Long. He was a dealer for some time before this piston matter came up. I might have met him constine before, but I might not. He was in Quincy at the time when I first met him, according to my recollection. I remember Mr. Long hims self stating he was in Quincy. I don't know when I first met him. I must have been chief engineer of Franklin from

met him : I don't remember. I don't recall that I met him

before 1918. I don't recall whether I met Mr. Long before I wrote that letter of April 17, 1918 to Mr. Long at Hannibal, Mo. I might have seen that letter before or after Mr. Franklin sent it. He might have asked me if it was all right to sent it to Long before he sent it, or might not.

The letter states: "I have your letter of April 13 and note with interest that you have a patented piston which shows up well in tests." I assume that meant Mr. Long made some tests and had written Mr. Franklin that he had a piston he was testing. I do not know what

piston that refers to.

I know how this piston shown in Exhibit 43 is constructed. We have had pistons similar to that; it may have been that piston as far as I know, but I am not sure it was all the same detail, but it was that type. I do not know whether or not it was that particular piston that was tested out. When reference is had to piston A, it meant that type piston, the type in the respect I was speaking of, having the four slots vertically, one horizontal, and the rib inside cut off on one side of the skirt.

I can't say that I remember the piston shown in Long patent 1,489,499. I would say it is quite different from the one shown in Exhibit 43. It has got an extra horizontal groove cut through, and you see that rib, the internal rib was entirely different. The internal rib is different by the fact that the webs are from the head instead of from the wrist pin bosses. I don't remember that piston specifically.

I wrote that letter of May 9, 1918. Long had sent us a sample piston that I asked for in that letter. That piston was the type shown on this print here, Exhibit 43. I don't know that it was that particular piston, but it was that type. When I say "type" I refer to the slot and the

internal ribs.

Referring to Exhibit 43, I don't know who made the original drawing of which this is a photostat. It is speci-

fied as Praya by Clark.

Re aring to Exhibit 42-B and particularly the report of July 20, 1918, the "Long cyl. steel body" refers to body structure of the Long steel cylinder. I don't know whose writing that is in pencil on sheet 3 of the report of July 20, 1918. I don't know whether that pencil writing was on there when I got the report. That must have been the Long piston, because it was on the piston without a rib on the suction side. That is the way I associate it because it states it has a rib on one side. Aside

from the records, I couldn't say that this particular piston was a Long, from memory, no. In that respect, my recollection is based upon that record. Without the record I would not remember the exact date or the exact piston of that particular time. The fact that it states it has no rib on the suction side is the thing that relates it in my mind to this type of piston, that, with the fact we had written Mr. Long for samples and had received them, but what connects it is the fact it is ribless type, ribless on one side. My recollection that it is the piston referred to in the report of October 5, 1918, is based upon page 2, sheet 3 of Exhibit 42-A. Special Long patented aluminum piston, slotted, and the reference to the piston having the ribless side; those were the two things. I don't find any notation of Long on Exhibit 43.

This drawing of July 9, 1918 is an experimental drawing. Why it was made, to be specific, I don't know.

I believe it is true that when we made that test of July 20, 1918, we made it on a piston sent us by Mr. Long. We might have made a drawing on July 9th because we might have had the piston. I don't remember if we made the drawing first and a test afterwards; I don't know. It might be unusual to make a drawing first and then make a test afterwards of a piston that a man sends us, and it might not; it is hard to say. That is not the usual procedure. I believe the piston we tested in July 1918, was one that was sent us by Mr. Long. The piston we tested could have been a piston that we made up ourselves from this drawing of July 9, 1918, Exhibit 43, but I donbt if that is what happened, because if after writing Mr. Long, for example, it seems to me we would have had a sample, said that is the first mention of the piston test on these reports, which conforms to my recollection of a Long A piston, my memory as well as the records. I should say that this Exhibit 43 piston was called an A type piston in the spring of 1919. If think we were still testing type A pistons in the spring of 1919.

I know about the agreement between Long and Franklin with respect to aluminum pistons. Defeadants'

I knew about the agreement between Long and Franklin with respect to aluminum pistons. Defendants' Exhibit AA. That agreement was entered into on March 20, 1919, as shown here, and its refers to an application, serial number 281,175; that serial number 281,175 corresponds to patent number 1,872,772, which was filed on

March 7, 1919.

We would be experimenting with the Long type A piston as shown in Exhibits 43, when piston covered by patent 1,872,772 is mentioned in the agreement, because

we had been experimenting with it and had secured enough results so we wished to go on with the experiments. It had been satisfactory only so that we wanted to go on with the experiments:

At the time of this agreement, the 20th day of March, or about that time, Mr. Long had submitted a piston to us like shown in this patent 1,872,772, but we continued to experiment with the piston as shown in Exhibit 43, after that. I do not know why that A piston was not

included in the agreement.

Those are my initials in the upper right hand corner of Defendants' Exhibit Z. I do not doubt but what I read that report. I should say that is a type B piston, that is what we call a type B. This type A piston was shipped May 3, 1919, or the preceding week. It was not until March 1919 that we received a piston with six vertical slots, two horizontal slots, and with the wrist pin bosses supported by a cross rib going over to the skirt and integral with the skirt, that is, like patent 1,872,772. I don't remember how it distinguished from that patent; I can't remember any details that might enter in it; there might have been a little more metal here or a little less here, or a rib here and not there, etc.

I can't say that the piston I just spoke of differed at all from Exhibit F; it may have in some minor respects but not in general shape. Exhibit F is the piston that the report of March 18, 1919 refers to; that is the same type piston. By "type" I mean that it differed only in small details. It may not have differed there, but I can't remember the infinite number of little details. On some things I remember very plainly, others not so well. I have to rely on these reports in some respects, a good deal in regard to the date, I remember that to a certain

extent

If I said that in 1917 we were testing pistons contimeously in production, I mis-spoke myself. I didn't intend to say in production. What I think, what I really said was that we tested a great many of the pistons, we ran tests on the pistons which were in production; we ran further experimental tests on those that we were using in production. That was done because the pistons used in production were not entirely satisfactory; we were looking for improvements. I think we ran tests on those pistons after we were using them in production, we kept on experimenting with them. It is natural to do that even for a year or so. I don't know what year we. sent the Long pistons like Exhibit F out to the service men. I had nothing to refreshethat date to my mind.

I recognize Defendants' Exhibit C. I don't know that this issued on April 8, 1920, but I assume it did, or

within a day or two of it.

On page 2 of Defendants' Exhibit C, it is stated "After April 15th the service department will be able to furnish Long type pistons in the standard size. These are straight pistons with two or three thousandths clearance. Their weight is approximately the same as standard pistons." I don't recall that the service department supplied pistons for engines in service after April 15th, but I can recall that they supplied pistons for engines. I can't recall specifically when all of the pistons—in fact, they supplied more than one kind of piston from time to time. I believe Long pistons were supplied by service after April 8, 1920. I don't know that they were like Exhibit F. After April 8, 1920, my opinion would be it would be type B piston.

Mr. Stellman had a great deal to do with keeping track of the development of the Long piston. I think perhaps he had more to do with it than I had, in detail. I believe it was under his immediate supervision at that

time.

I said that sometime in this period between 1915 and 1920 we were testing slipper pistons. I don't recall where we got them. During that period we tested Wainright pistons, we tested the Zephyr piston, I believe a Mosers piston, we tested some composite pistons with aluminum head and east iron skirt, we tested some cast iron pistons, probably more than that but that is all I recall off-hand.

I don't recall what kind of vacuum tanks were being used on the Franklin car in 1918, nor do I remember

who they were made by.

I don't know what kind of ignition system was used on the Franklin car in 1918, neither do I know what kind of speedometers they were using. I do not know the difference between a Stewart No. 2 and a Stewart No. 3 vacuum tank. I do remember what kind of a Long piston was used in 1918, and also taken from my records. I have to rely on the records to a certain extent, yes.

What the record says, plus what I remember of the

piston, plus the drawing, goes together.

I arrived here in Cleveland Wednesday morning. I am going to send my bill to Richey & Watts for my trip over here, for expenses plus compensation for my time. I have investigated these Franklin records, and I expect to send a bill for the time spent by me.

Mr. Brumnga: That is all.

I don't believe I can recall from my mind whether or not these facts that I have read from these reports into the record were true and correct as of the time when that report was given to me, aside from the records. I know that we were running these kind of tests all the time. I know that these things were under tests, but I can't remember back that time in my mind; no, I take the date from the records. Those records refresh my recold lection as to the facts reported in them. I do not remember whether the first Long pistons of the type B were relieved over the bosses.

Mr. McCoy: The letter identified by the witness, Franklin Company letter addressed to Mr. E. C. Long and signed by R. Murphy, dated May 9, 1918, is offered in evidence as Plaintiffs' Exhibit 44; the letter dated April 17, 1918, addressed to Mr. E. C. Long, signed by H. H. Franklin, is offered in evidence as Plaintiffs' Exhibit 45; the reports referred to by the witness, marked Plaintiffs' Exhibits, 42-A, B and C are offered in evidence under the same numbers; and the photostat referred to by the witness is offered in evidence as Plaintiffs' Exhibit 43.

Mr. Brunings: I object to the photostat, for the original is not produced, and it not having been shown the original is lost. That is not a farmal objection, either, because the top of this rectangular part in the lower right-hand corner is so faint in some parts that the objection certainly is well founded.

The Master: I will receive it subject to proof as to the disposition of the original, or something so that it can show this can be read, this is not readable.

Mr. McCoy: Yes, your Honor, also the photostat is offered as the paper to which the witness has referred to refresh his recollection.

The Master: It may be so received to that ex-

Mr. Richey: And would of course also be competent as in the nature of a present day recollection drawing, in any event.

Mr. McCoy: That is all

STEPHER R. Caston, a wite ess called in rebuttal by Plaintiffs, first being duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Stephen R. Castor. I live at Jordan,

New York. My age is 45.

I was employed by the Franklin Company, Syracuse, New York from 1916 until October 1918, and from 1920 to 1931. It just came there as a draftsman; afterwards chief draftsman; afterwards designing engineer. My elerical dutic consisted of making out a drafting room report; it was incorporated in the big report, each department of engineering submitted their report. Those reports were referred to me; they weren't referred to me directly, they went to the stenographers and were written up, then the stenographers worked under me. When I received the reports they were filed away under the custody, ordinarily, of the head stenographer. She was under my supervision as long as I was chief draftsman or designing engineer.

I was acquainted with the experimental routine of the company over a period of a good many years, that is anything that was developed in the experimental department, why, we would have the job of designing it and putting it into drawings and records of the same. I had that duty between the years 1916 to 1918, inclusive, that is, up to October 1918, when I severed connection with the com-

pany.

I have had occasion recently to review those reports of 1916 to 1919; I went over them very carefully. The first reference in those reports to tests made on Long pistons was in the July 1918 report. The type of piston referred to in this report had a rib across the head in , between the wrist pin bosses and extending down one side. The rib was cut off on the other side. On the first test, the piston was installed with the ribless side on the suction side of the motor. The piston had a stiffening ring at the bottom, and it had four vertical and one horizontal slot sawed in the piston. All of the slots at the side of the wrist pin bosses and two of the slots on one side extended from the bottom of the piston up towards the top for a ways. The rib was in between the wrist pin bosses, and the slot was at each side of the wrist pin boss, the ribe like this, two slots went up this way, two this way (indicating). Two of the slots went up and then the other two slots started from underneath the lowest ring, somewhere in that neighborhood, and ex-

tended down for a ways, and at the top of those two slots there was a transverse slot that joined those two slots. That was on the ribless side of the piston.

I could identify drawings of this piston from the records that I examined, and in accordance with my recollection. That drawing was our P-2912; I mean the Franklin drawing. Mr. Clark made that drawing and it was checked by Mr. Both. That drawing was made under my supervision on July 8, 1918. I would recognize that drawing if I saw it.

(Witness examines drawing.) This is the drawing to which I referred, photostat, Plaintiffs' Exhibit 43. I can't say definitely where the original of that drawing is; it is perhaps in the files of the Franklin Company.

I couldn't tell from my own knowledge, independently of any markings on this drawing, whether or not a drawing of that general character was in those files on or about July 9, 1918.

(Objection by defendants.)

This drawing, Plaintiff's Exhibit 43, P-2912, was in the Franklin Company files from July 9, 1918, if it is still there; that is what we call an experimental drawing. There is no very careful account kept of those drawings after a number of years, say like 10 years or so, they might have been thrown out.

Mr. Bruninga: Object to that as a conclusion of the witness.

I did not make a search for the original from which this photostat P-2912 was taken. I can't say under what circumstances that drawing P-2912 was made; it has been

too long ago to remember it.

A know of my own knowledge of another type of pieton submitted to the Franklin Company by Mr. Long. We had a piston that we were in production on a great many years and it had a rib across the head in line with the wrist pin, and two ribs at right angles to the wrist pin bosses, which connected the wrist pin bosses to the side walls, and there was six slots running from the bottom of the piston up to below the lower piston ring, which divided the periphery of the skirt into aix pieces, and four of those pieces were supported by the two struts, we called them. I can't tell you of my own knowledge when first I saw a piston of that character, but our records show that in March, 1919.

Mr. Sutherland: I object to what the records show. The records themselves are the best evidence.

Mr. McCoy: The witness has testified he examined the records; they are the factory records produced under his supervision.

(Narrative continued) The records show that in March 1919 a piston of that character was tested by the Franklin Company. I wouldn't attempt to say from my recollection, because it is 15 years ago and my memory isn't so good as that. The record refreshes my recollection as to the date. March 25, 1919 I believe to be the correct date; there is a description of that piston.

So far as I could determine definitely, March 15th there was a report that might have had to do with that

same piston.

Q. What was the character of that report?

Mr. Bruninga: I object to that unless the report is produced.

Mr. McCoy: I think we have it here.

A. It speaks about a test made in the laboratory on the pistons, .002" clearance.

(Narrative continued) The results of that test were that it had a tendency to set up and they thought it was a little stiffer on account of the baffle plates not allowing quite enough oil to go down the piston and the cylinder walls.

Mr. Bruninga: I object to what was thought.

(Narrative continued) In 1923 I went over the records, looking up the records of when the first Long pistons were brought in. I have made other investigations since 1923; I should say twice besides that at least. All of these investigations, as to the first time that I found mention of a Long type piston of the two vertical webs connected with the skirt wall that is separated by six vertical slots, agree; I found the same results each time. The date of that was March, 1919.

I also made some investigation of those reports to find the first time that E. C. Long or E. C. Long pistons are mentioned in the reports, and found that it was July 1918. I had previously made investigations to locate

that fact

I am the Stephen R. Castor who testified in interferences 49,569, 49,570 and 49,571.

I recognize Plaintiffs' Exhibits 42-A, B, and C. They are the experimental and mechanical laboratory reports for the Franklin Company. Frank Chadwick, the head stenographer, had charge of the files for these reports Exhibits 42-A, B and C, at the time I was working with the Franklin Company, on October 5 of 1918 and July 20, 1918. They worked for me, except when I wasn't there. I left the employ of the company in October 1918.

Mr. McCoy: Direct examination closed.

CROSS EXAMINATION by Mr. Bruninga.

I testified in an interference in which Mr. Richey and Mr. McCoy were both counsel for the same side that called me. I said in that case that I had also made searches of these records of the Franklin Company. I said at that time that the first record that I was able to find was dated October 5, 1918. I have now made another search and found a set of reports, Exhibit 42-B, dated July 20, 1918. (Witness examines exhibit.) The reason I didn't find the report of July 20, 1918, is because the piston was identified by a pencil note on it, and it was easily overlooked. You see it is marked with a pencil, it says "Equipped with Long patent piston." That was overlooked. In the other reports it is in the typewritten. I don't know if that pencil notation was on there in 1926 when I looked over these records—I think it was. Mr. Louis Stellman put it on, it is in his handwriting. It being in pencil led me to overlook it. I just looked for reports that had Long's name on them. I looked the reports over very carefully this time to see if there was any description we could identify as Long's. I didn't look so carefully in 1926. I doubt if a still more careful search would uncover something earlier. I would say I have all the reports of tests of Long pistons before this Court.

I went over 1918 twice just recently, and 1917 very carefully, and no record was found marked "Long" of

that I could identify as Long.

I left the Franklin Company in October 1918. If don't remember the exact date. I couldn't say whether the first or the last. It might have been that the October 5, 1918 report was not under my direction. That is true

of the May 3rd, 1919, report.

I have a business of my own now, that is, I am selling insurance. I have been away from the Franklin Company since August 1st, 1931. I started at the Franklin Company again in May 1920. I can't say whether it was before or after the date of May 3, 1919, Exhibit 42-C.

It is probably correct that the only report filed under my

supervision is the one of July 20, 1918, 42-B.

I met Mr. Long many times. I can't tell you when I first met him. I don't think I met him first on April 1st, 1916.

Q. You saw that six-slotted, across-rib piston along the order of Exhibit F in 1916 or '17, didn't you! A. It is so long ago I can't remember.

Q. Well, you wouldn't say you didn't see it as early as 1917?

Mr. Richey: Object. He said he didn't remember.

Mr. Bruninga: Don't object because I am cross examining this witness on a point, you simply object and don't state what he remembers and what he don't

Q. You wouldn't say you didn't see that as early as 1917, a piston of that type, would you now! A. There is no record of having one around the place as early as that.

Q. Didn't you tell Venner about a year ago you thought you did? A. No.

(Narrative continued) I haven't seen Venner in seven or eight years. Yes, I know William Venner, the fellow with the St. Louis dealer. I don't remember seeing him recently. I don't remember seeing Venner for

a long time.

I did not see that particular type piston like shown in Exhibit F before 1918. As I have told you, I should say the first I ever saw it was in 1990 at the Franklin Company. I might have seen it in 1919. Now, what's the use of asking mo! I can't remember that I naw that, I am not going by my memory, I am going by records that I have looked over; I am not going by memory at all. That also applies to this drawing, P-3912. I don't remember of Clark making that drawing, except from seeing his name on it; that is how I tell that Clark made it. I probably did see him make this drawing. I don't have any recollection of seeing him make it, but I can swear he made it because his name is on it. I can swear a certain man checked it because his name is on there, and because it is in their handwriting. The handwriting on that exhibit (indicating exhibit) is that of Clark; there is his peculiar marking, which he often signed. Because of the marking on this drawing, is the only way I can tell that it was made at the Franklin plant.

That drawing was made as a record of the piston we was going to test. I know that because it was our usual practice. We would get a sample in, we would take and make a drawing of it, a record of it, and then we would test it.

I know that that drawing, Exhibit 43, P-2912, was made in the Franklin Company. I know that it was made from a piston. I probably saw him make it from the piston. As I told you, that was our practice, we would get a sample in, send it to the drafting room, make a drawing, an experimental drawing and send it down to the experimental room and test it. That is good reasoning. I probably did see that drawing made from a piston.

Q. Can you swear that you did! You can't, now,

can you? A. (No response.)

I am so absolutely certain that that drawing was made from a piston, because I have been through that year after year, year after year, you do the same thing over and over again, and you know that is the way it happens. That is the way I reason that this happened. That is my belief.

I don't remember of ever seeing a piston like shown in drawing P-2912, Exhibit 43. The records show that a piston like that was on test at the Franklin Company. I don't know from my own knowledge that it was, but

from what the records show.

The first piston that came to Franklin like Exhibit F was in 1919. I first saw it in 1920. I take that from the records where it is very clearly described, drawings of it in the reports. I take all of that from the reports. I did not make the report that the piston is described in.

Q. But it bore a certain date and you took that, you reasoned the report was correct, that the report had that date put on, and then you determine in your own mind that that was the first time you saw that piston at the Franklin Company, isn't that right! A. Yes, we have to go by those reports.

(Narrative continued) I think it was fr. Edgerton who asked me to make a search of the records in Franklin in 1926, when I testified before; it was someone from Richey & Watts office, and I made the search of the records. I got paid for doing that work at that time.

I testified in Cleveland at that time. My expenses were paid. They said if I didn't come they would subpoen me; I didn't have any objection either way to

coming; I was neutral. I would rather not come in 1926, but I didn't refuse to come.

Q. In the previous deposition you testified as follows, when the question was asked you by Mr. Richey: "You declined to come here voluntarily to testify until you were threatened by subpoens, and then came to save the trouble and expense of a subpoens, didn't you?" And you answered, "Yes." You didn't understand the significance of that question, did you, from what you previously said? A. Yes, I didn't want to come.

(Narrative continued) I didn't refuse to come; no object in my not coming.

Q. I notice that you were able to call off without ever looking at Exhibit 43 "P-2912, July 8, 1918." You have a good memory, haven't you! A. Pretty good.

(Narrative continued) I have alvery good memory for short times; I can't remember 15 years back, though. I might remember the drawing P-3984 from the Franklin records if I saw it. I have seen the orginal of Exhibit BB in the Franklin records. The draftsman's name was Sometimer. I knew him. (After examining drawing.) I can't make out who checked it, he didn't write very strong. Yes, I have seen that drawing. I brought that drawing with me; I didn't turn it over to Mr. Richey or Mr. McCoy; I have it here in my brief case. (Witness produces blueprint called for.) I should say that this blueprint that I have just produced was made from the same tracing as Exhibit BB.

Mr. Bruninga: Well, in order that we may be sure about it, I will offer this blueprint produced by you as Defendents' Exhibit BB-1.

. Mr. Richey: I object to it as duplicating the

record.

Mr. Bruninga: Well, if you agree it is a dupli-

cate I will leave it out.

Mr. Richey: He said it was. I will agree to it if the witness says so.

(Narrative continued) They are duplicates, I should

I have some blueprints of other types of pistons submitted by Mr. Long. (Witness produces blueprints.)
This one isn't very good because the date doesn't show.
This date was 1990, something like that. Those aren't submitted by Long, you understand, they were made in the Franklin plant.

1/16/20, of course that isn't very good evidence because it has been marked with a pencil. That looks as though it had a steel skirt on it, or cast iron skirt, probably not a Long piston; that is a different type of piston. That is not a Long. It has got a cast iron skirt. I thought that was a Long but it is not.,

That is the only Long type piaton drawing I brought along, only our regular production deswing which is similar to the one you have.

I haven't got a thing back of July, 1918, that I found relating to Long pistons, or that, as they are read over carefully, might relate to Long pistons. If I had, I would give it to you. I am neutral, I don't care. If Mr. Long has it coming to him, I hope he gets it; that is where I stand on it. I tried to bring in the truth of the records as we found it there. I haven't a thing that would help your case at all, or anything that would hurt it. I haven't anything to help the case because I don't know as it can be helped. As far as I am concerned, you see, I don't know all the situation. There might be lots of angles I don't know about outside of the Franklin Company. I wouldn't say that you are going to lose the case, I don't know. You may have lots of evidence some-

I have no drawings or sketches that I found in the Franklin Company that go back of the year 1920, except

the 1919 records which have been produced.

Beferring to Exhibit BB-1, that piston not put into production. I knew that. This is a drawing of the piston. When Mr. Long brought the piston there, undoubtedly that was the drawing that was made, and I get that from the record, the same practice we had before. That was the practice over there, and I know from previous practice that was ordinarily followed.

I hope my expenses are being paid here, I haven't investigated those records and come here and stayed around Cleveland for nothing. I expect to be paid.

Mr. Bruninga: That is all.

RE-DERECT EXAMINATION by Mr. McCoy.

I don't know whether or not Mr. Stellman has recently been over the records of the Franklin Company. To my knewledge, Mr. Stellman has not been over these experimental and mechanical laboratory reports within the last two years or three years.

Mr. Edgerton put the small metal clips on the side of these papers. I saw him put them there, he and I were looking them over. They were not on there before we looked them over. The facts that I have testified to are from my best knowledge and recollection of the facts as to the datas have testified to.

Mr. Bruninga: I want to tell the witness "knowledge" means what you know, not what you

figure out. Let him answer the question now.

(Narrative continued) It is necessary to figure it out, as I say, you have been through it for years and years.

I had been over these records before Mr. Edgerton went over them with me, not as carefully as I did this

time, but pretty good.

Mr. McCoy: Re-direct examination closed.

Ra-Choss Examination by Mr. Bruninga.

Franklin used the Long piston up to the series 12, which was about, say 1929, from 1930 to 1929; about eight years. I don't know how many cars they were used in, I haven't any record but there was quite a good many cars made during that time. As to our average production, some years we made 10,000, some years they only made six, may be eight; eight would be a fair estimate. For about eight years those pistons were used. On an average of 8,000 a year, that would possibly make 64,000 cars the Long pistons were used in, and with six cylinders to a car. That would be ever 350,000 Long pistons. We discontinued using them because in the 135 we went to the 3½" bore, high compression, and the Long pistons wouldn't stand up; we got beyond the limit of the Long piston; secred on the strut. Then we changed over to the Invar Strut. That was about 1929.

RE DIRECT EXAMINATION by Mr. McCoy.

The clearance we used with the Invar Strut was about three thousandths, two and a half, I think two and a half we ran them for a while, two and a half to three thousandths. At the time we changed from the Long type to the Strut type, steel strut type piston, we were fitting the Long pistons about five thousandths.

RE-CROSS EXAMINATION by Mr. Brunings

And the sole reason we changed over to the Strut type piston was because it was better than the Long type. Patent litigation had nothing to do with it, at all.

Mr. Bruninga: That is all. (Adjournment to following day.)

(9:30 A. M., Saturday, February 4th, 1933, the hearing was resumed.)

Mr. Bruninga: I have here a photostat of a letter of Anna Landon Dake, dated October 17, 1932, and reading as follows: "Iowa City, October 17, 1932. Mr. J. H. Brunings, St. Louis, Mo. Dear Sir: I have carefully gone over the abeets of records which you sent me and have placed my initials 'A. L. D.' on the back of the ones that I recognize as work done by me at the W. K. Weems place. Trusting that this will give you the needed help, I am, yours very truly, Mrs. Anna Landen Buke." The initialed photostats of V-1 to V-7 of the pertinent pages from those books have been offered in evidence in lieu of the original books, and I understand counsel is willing to agree that if Mrs. Anna Landon Duke were called as a witness, she would testify as noted above.

Mr. McCoy: That is correct, your Honor.

don't think it is necessary to introduce it in evidence.

Mr. Brunings: I will offer the photostat as 5-J.

Now, instead of the answer in the Simmons case,
I would like to introduce in evidence, as soon as I have it available, a copy of the record before the Court of Appeals in that case in Equity No. 3510. I believe that will be for the convenience of this Court, and this Court has considered the matter anyway, in connection with the question of whether plaintiffs can introduce evidence as to the connection of Sterling Products Company with this case. I expect to obtain another copy of that record in the next few days, and I will introduce that in evidence now under the same designation 5-I.

Mr. McCoy: You had some witnesses, the

names of whom you were to give us.

Mr. Bruninga: With reference to Mr. Schoengarth at Ironwood, Michigan, I am going to make every effort to get Mr. Schoengarth and one or two

supporting witnesses down here. I puderstand there is a man by the name of Garner, the other one I don't know as yet. I am going to try my best to have them down here instead of having counsel go up to Ironwood.

Mr. McCoy: We would like to have the reservation that the deposition be taken at such time as Mr. Richey may be able to attend.

Mr. Bruninga: course I will do that. The Master: Yes, certainly.

(Counsel for defendants agreed to furnish counsel for plaintiffs addresses of witnesses to be called.)

(At this point testimony of Gulick, Record pages 699 to 704, was taken.)

JOHN L. BURNS, a witness called in rebuttal by Plaintiffs, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. Richey. . .

My name is John L. Burns. I live at 225 Reed Avenue, Syracuse, New York. I am employed by the Franklin Company, The H. H. Franklin Company of Syracuse, New York. I have been employed by them for 28 years

anyway.

My first job for them was as a tire man; the next job was a roadman out for service, until 1907. From 1907 until 1910 I was a sales department territory man. The year of 1911 I was superintendent of the New York branch of the Franklin Automobile Company, a selling organization of the H. H. Franklin Manufacturing Company; and in 1911 wound up my work there and I became a member of the engineering staff, engineering departmeat at the plant in the capacity of chief inspector, chief tester in the testing of cars. I served in that capacity, until January of 1918 when I became a member of the experimental division of the engineering department. From 1915 up until 1918 my job primarily was to improve the car, that was the work that I was supposed to take up, as I went into the experimental room from the testing division, and that work was to well, anything that gave grief on the road, or anything that was hard in manufacturing, my job was to find improvements to make the car a better car. That continued up to now.

The nature of the trouble with respect to pistons from 1915 up until 1920 was noises, set ups, slaps, piston slaps and piston scoring. By "set-ups" I mean when the clearance is insufficient or the design of the piston does not allow the walls of the piston to yield and give and make a smooth operating job, instead of that there is something there that is rigid, we didn't know what was going on for a long time, and the alloy of the metal would pick up on the cylinder wall, and then it would build up, set up, that was due to trying to make the piston a quieter job in some cases, in other words, it slapped with the tolerances that were required to make it not score.

When this "set-up occurred, metal from the aluminum piston would deposit on the cast iron cylinder wall. When it did that, you just stopped and pulled your motor

down, and put in new pistons, as a rule.

Up from the series 9-A, the 1916 model, up to 1919, we were using an ordinary aluminum piston with a rib on the inside of the skirt, and there was all kinds of modifications of the original. The original was just a plain skirt piston with oil ways running in some cases in the form of a thread, in some cases just cylindrical rings attached around it; that was the standard piston then. Then they got into slotting, then they came in to put in expanding rings on the bottom of them; oh, there was various things to try to make the job satisfactory. Nothing ever was done, though, to make the job satisfactory from that original type of piston.

Comparing Exhibit B piston with the type pistons I am speaking of, that is the original piston that we speak of in the 9-A, and that is the one I spoke of as the original piston that had given us so much trouble. The expander ring wasn't the answer, it wasn't consistent, you could put an expanding ring in the first time and the results you got just prompted you to go further with it, and the final analysis was it wasn't satisfactory; it caused dragging and power losses so tremendous that in some cases was due to the un-uniform wall tension of this spring that was slid in. The piston we put the ring in apparently would be better than the original piston without a ring, but there wasn't any of them that was a satisfactory piston. It compared in structure with the Exhibit B practically the same as that except they would turn a little bit of a way inside there and snap this ring in it; it would be a regular piston, only we would take that out of cars and have a little bit of a recess made in

there to hold the ring in position; they would be the same piston, you understand.

O. Will you state whether or not you yourself were working on this problem of trying to cure these troubles? A. My gosh, everybody was working on them. My job was inspector of the testing shed. I turned down the cars for the engine being noisy, and the experimental department, which was another division in the plant, would come over and try to give us a little help with the grief we were having, and make various suggestions, and bring over different things for us to put on.

(Narrative continued) Besides the schemes I have named, that were used to try to rectify these troubles, we used to put an expanding jack inside of them, and throwed them aside discarded them; and the fit of the wrist pin was changed from time to time, feeling, well, I suppose if we put a little drag on the wrist pin fit, the clearance, it would change the picture a little bit. It was just one continuous thing to another; every week somebody had a suggestion and we would follow it through. And to make the aluminum piston stay in the Franklin enrine, that was the whole thing, because it had some features light weight over the cast iron; it was a nice piston to think about.

Other schemes we used were: the expanding rings. and the slots, and things like that. That would cover it. In other words, take a piston like that, and give it another thousandth or thousandth and a half, or two thousandthe, or right in that area through there, which seems to be the bug-a-bee of the set up. For an inch below the bottom ring, we would relieve it; between the top of the boss holes and the bottom ring we would change the area there.

As to other types of pistons tried by us besides this Exhibit B with the ring, up to January, 1918—now, my job was on that original piston, and its various modifica-tions; up to January of 1918 it was always with this original piston in various alots and expanders and jacks and clearances, and all that stuff, but after January, 1918, I became a member of the experimental division, that department was the department that was trying all the different samples submitted of various makes and alloys and those things, and iron and cast iron pistons, with compromises the Wainright cast iron, and the slipper type, and Dahl metal, they used to designate it,

and Zephyrs, and all the other pistons that was coming, that was coming up, they all had to be tested. I made some of the tests on these pistons. If I didn't supervise the installation in the car or in an engine in the car, why I probably drove the car on the road, because that was one of my jobs, was taking something that would make the car a better car, that was my job to improve the car.

In January 1919 there came to my attention a piston of Mr. Elmer C. Long. I made an installation in a car owned by the company but driven by Mr. Murphy, our chief engineer, of a set of pistons that was handed to me as Long pistons.

Describing that piston, it was a lot like this one (indicating Exhibit B) except it had a T-slot in it, that is this vertical slot ran into a slot that was around this way, and on the inside it had what they call its, on the inside of the skirt. That is my first recollection, you might say, with the Long piston, as I knew it.

Mr. Bruninga: Have him describe that piston a little more fully, Mr. Richey.

That is the way I remember the piston, the slots in it carried up through, because our slotted pistons had those slots like this (indicating Exhibit B). This Long piston was carried square, running into the other slot.

Q. Now, what if anything have you to say regarding whether or not there was a U-slot in that piston, if you remember?

Mr. Bruninga: Objected to as leading. The witness has said there was a T-slot in it.

(Narrative continued) There was several slots, but the difference between that slot and our slotting was that the vertical slot ran up into another one, where ours stopped in the middle of the skirt, approximately.

Comparing the drawing, Ekhibit 43, with the piston which I installed in the car in January, 1919, this is the type piston that I speak of. By "type" I mean this slotting and all this ribbing and the general appearance of it. The Exhibit 43 piston is the piston I installed. I installed a set of six in the car, six cylinder car. The first time I ever saw one of these pistons like shown in Ekhibit 43, was January, 1919. The car was driven by Mr. Murphy, he was driving, he always drove a car previous to the announcement of a Laucei. In other words they would build a car and Mr. Murphy would get it to try out the

different things for a period of six or eight months previous to the announcement of that model. In other

words, he tried out the preliminary car.

The pistons installed in that car were noisy, it wasn't wholly due to the design of the piston, the cylinders were worn. I operated the car with the pistons in it, in the engine. When I saw them they were noisy, had slaps. The clearance was supposed to be 3-5 because the cylinder was supposed to be gauged, in other words, the piston should have been 3.245, 3.247, but the cylinder was worn two and three thousandths, some of them, so that it had more than the clearance that it was supposed to have, but the particular cylinders had something else in them, they wanted to continue testing, that

is why they were left on with this type.

There also came under my observation a piston of Mr. Long's different from the one I have been talking about here in Exhibit 43. In the middle of March, 1919, Mr. Long came to the factory, because he walked into my department with Mr. Stellman, and Mr. Stellman introduced him to me, and he had—well, they had a set of pistons, I don't know whether Mr. Long had brought them, but it was a set of pistons they had with them and Mr. Stellman told me to get a car, sales department demonstrator, and get the cylinders and pistons off it immediately, they had a set of new Long pistons they wanted to put in this car and were anxious to get away before the day was over, wanted to leave on a trip. And it was a set of pistons that was different than the set of pistons I put in Mr. Murphy's car.

The piston shown in Exhibit 43, that we put in Mr. Murphy's car didn't have any designation, as I

remember it, at all.

The piaton that was brought to me in March, 1919 was my first acquaintance with the piston that we later knew as a Long piston. That is, it had a strut going, surrounding the wrist pin boss, carrying over to the skirt, and it was a straight ground piston; anything before that was always taper ground, any piston regardless, and that was the first contact I had with a straight ground piston. That is about all I remember about it; of course, it had slots carried on through. There must have been six slots, one in the middle, on each side, and up through the side with the wrist pin there were slots. There wasn't any skirt webs running vertically, there was webs in the head, and there was what—if you call them webs—there were two struts carried over

around the wrist pin boss, and over to the skirt. There was horizontal slots in it, the head was separated from the skirt, except the ribs that carried from the head down to the wrist pin boss.

Comparing the drawings of the Long patent 1,872,-772 with the piston that I saw in March, 1919, this is the

piston here.

After Mr. Stellman and Mr. Long brought me those pistons, we installed them in a demonstrator, that was a car, it was a practically new car, had approximately 1200 miles on it; in other words, it was well broken in, and we removed the pistons and cylinders that was on it and made an installation of near cylinders and pistons. I supervised the work, that was my job; I had mechanics there working on it. I was given the assignment by Mr.

Stellman to get that job through.

Besides the mechanics and myself, Mr. Long was, there all day. Mr. Long didn't have anything to say about these pistons; he just relied on my work to see it was done, there wasn't nothing to do in the line of fitting, it was simply a case of taking off the cylinders and the yokes and the pistons and making a proper installation of the new pistons, and dropping the cylinders on and coupling up the affair—well, it was in the middle of the morning when they came in and they went out in the late afternoon, so you see there couldn't have been an awful lot of fitting of any description; simply a case of putting on what he brought.

I remember Mr. Long saying he had something there that wouldn't set up. He said, "I have a piston here that

won't get up." That is the remark he made.

The pistons in the car in which we installed this Long piston like the one shown in the patent, were Long pistons with a T-slot. That had been put in in the plant, that had been put in the car in the engine assembly, and my job was to get that car that was operating with those pistons and bring it down in the experimental room and remove them and put on the new pistons Mr. Long had. The pistons in the car before we put in the new pistons were like Exhibit 43. The clearance given the pistons like shown in the patent was .002" straight ground. That piston was known at that time as "Special Longs." The piston that we put in that is like in this patent that you are talking about was known as "B." Later on the piston shown in the drawing Exhibit 43 was called "A."

I know nothing further about the history of the

type A Long piston.

The type B piston, from that installation there, was worked on practically 100 per cent until the time it was installed in production. It was probably installed in production in the fall or winter of 1919, and it continued

in production until 1998.

There were records kept of the tests in the laboratory and in the engineering department between 1915 . and 1920. Of course, from January, 1918, I wrote a report weekly of the activities of the floor or of the car end of the experimental department, and that was incorporated in a whole report of the entire engineering department, laboratory, mechanical department, and laboratory tests, the body division, and one other, and they were all incorporated in one report. In other words, my report and somebody else's report from the mechanical lab and the chemist, he put in one, and the body division put one in, and that was all incorporated in one report, and then a copy of the whole report was cent back to the experimental department, and I would these over from week to week just what the whole report was, because there was comothing that was carried on in the other departments, so that an engineer, if he was smart, he would look the whole report over. Every week a copy would come back to me containing my report with the others.

In connection with the physical work of writing up these reports. I wrote the car end of the division; that is, if there was anything done on a car, my improvement made, or my dismantling or my additions made to the experimental cars, that included mileage cars, Mr. Williams car, Mr. Murphy's car. My job also was to keep Mr. Franklin's car is first class running order; anything that was done was reported on because we used to use these cam for various experiments, and naturally I would write them up at the end of the week what was done, to keep everything before the engineer. These records were the official records of the engineering department of the Franklin Company. They were always relied now by the

relied upon by the engineers as such.

(Short recess taken.)

Those reports speak of vendors of various things coming to the plant, with certain pieces. Now, suppos-ing there was a piston pin brought there by a vender, a manufacturer, a representative of the engineering demanufacturer, a representative of the engineeti partment, they met them and if they had consett merit, he would tell them to cond in somethi

test. The report contains those notations in there. Now. anything that was actually tested is in the report, in the

weekly report.

The reports in front of me on the chair are reports from the various divisions of the engineering department, written weekly and sent upstairs into the engineering office, and the chief engineer would digest, he took those various reports and would make them into that report as you see it. These are the records we have been talking about. This is from 1916 to 1919, inclusive. Those are all of the records for those years; those are the reports every week. I have gone through every one of them.

The first record of anything with the name "Long piston" in this bunch of reports, is July, 1918. It refers to a test conducted in the liberatory. That would be the first one I would recognize as a Long piston, was in July, 1918. I don't know what that piston was, but it mentioned that it had ribe on it, on the inside of it. I would say it was the type A piston. I base that statement from the fact that the type B, with the rib on it from the wrist pin boss, was the first time that I knew the Long piston in its present form. That is, the July piston was different from the Long piston as we knew it later on. I have examined this item of July, 1918, to which I refer. In making this test they spoke of where the rib was. Now, the Long piston with a strut in it did not have any rib in it, and in the report it talked about when they tested a Long piston where there was an interference and the cap serow striking the rib. Now, in the Long piston is no rib that that in the Long piston of type B there is no rib that that wrist pin holding bolt could strike. The type A piston had it.

There is nothing also in that report of July, 1918, that enables me to say whether or not it was the type A or type B piston, than the things I have already named.

Can I use the little note that I made out of that report? I have some notes here in my pocket I haven't need, but I made some notes where the references came to Long pistons to enable me to give my testimeny cor-sectly. I looked over these reports yesterday. I did not look over them prior to that. I looked through them to be able to talk honestly. I was looking for the place in that report where I first installed a struct type Long piston, and it was the time that Mr. Long came to the plant in March of 1919, but I wanted to get that date

accurately, because it could have been January or it could have been February, but I wanted to be sure it was March. Now, I wouldn't say up to yesterday that it was actually March, but I knew it was in 1919, because it was in the spring of the year and it was hard going when I made that installation.

I looked through the reports from 1916 on. The purpose of looking through the reports from 1916 on was to get the starting point of the Long piston coming to

the plant. I made notes from those records there.
Referring to my notes, the first notation on Long
piston was July 20, 1918, enying no rib on the suction side; next October 5, 1918 it mentions the Long patent. It says one rib on the exhaust side. In other words, those two pistons are the same. It designated them with no rib on the suction side, which means a nib on the exhaust side; and with one rib on the exhaust side, which would really mean no rib on the suction side. That was

October, 1918, in inhoratory work.

The next reference to Long's piston was in January 1919, January 18, Mr. Murphy's ear, the first mention of a Long piston being installed in an automobile, car en-

gine. That refers to the installation I made.

The next reference I find is on March 8, 1919, in Mr. John Wilkinson's car, new car. The report says that that was a "one rib Long" piston. That would be type A. March 15, 1919, sales department demonstrator. It says here: "Removed Long patented piston .003" to .005" clearance, and installed special Long pistons with .002" clearance, and three wrist pins." That was type B. After that I found references to the type B piston. On March 22, 1919 was the first mention made of Long piston with sides supported by ribs to wrist pin bosses.

Referring to Exhibit 43-A, B, and Cathose hre parts of the record which I have described as being the records of the Franklin Engineering department which I looked

over yesterday.

Mr. Richey: Now, we offer for the inspection of the other side all of these records. We see no need of offering them all in evidence. They are original records of the Franklin Company, and of course they don't want to let them go.

The Master: Of course they want a little time

to examine the

Mr. Bruninga: I will go ahead with the cross examination of the witness. I don't know whether I want to see them or not.

(Narrative continued) I did not make an inspection of those records at the Franklin plant within the last week or two; I inspected them over at the office of Richey & Watts. Mr. Edgerton and the gentleman in the library, Mr. Snyder, was there at the time. There was various ones coming in and out there all during that time. Mr. Castor was not there. Mr. Murphy was not there.

Mr. Richey: All right. You may cross examine.

CROSS EXAMINATION by Mr. Bruninga.

I believe I testified for Long in an interference proceeding in 1926, down in Bodell's office.

Q. You were asked this question at that time: "What year was it, then, that you first worked in the experimental room?" and you answered: "1917"? A. Yes, but I didn't go into the experimental actually until January, 1918; that is, as a part of that division.

(Narrative continued) It is a fact that I worked in the experimental room in 1917. I was in and out of there all the time.

Q. You were also asked this question: "Then is it possible that both Mr. Marks and Mr. Stellman experimented on pistons prior to 1918?" and you answered: "Yes, sir"? A. I suppose I testified that way.

(Narrative continued) I don't recall what I said in that thing; you would have to tell it to me. It is possible that Mr. Stellman might have experimented on pistons prior to 1918 without my knowing about it. For all I know, he might have been experimenting on Long pistons prior to 1918. I haven't found any records of 1916 on that, our record doesn't show anything in 1916, and it

doesn't show anything until 1918.

I saw and went over those records at Richey & Watts' office yesterday. They are Franklin Company records. I did not bring them over; I don't know how they came over. I didn't search the records at the Franklin plant. What I am testifying now is what I found in those records before the Court which I found in Richey & Watts' office. I feel that that is the engineering record of all those weeks, week and week. I know they are. I know that is a complete record of the complete report of the engineering department. There might have been somebody take a sheet out, I didn't count; there is no numbers on them; but it is pretty complete. It is all connected up.

It is possible that there are other records at the Franklin plant. It is possible, but not probable, that there were other records in 1916 and '17 and '18 and '19 at the Franklin plant that I do not have in that file. I feel that the report is a complete weakly report. Now, if there is anything taken out of there, it wouldn't be connected the way it is. I went over them sheet after sheet yesterday. I didn't have anything to do with that report until yesterday, in Cleveland, and I went through it to be honest in my testimony; that is the idea.

I first met Mr. Long in 1919, and I was introduced to

him by Mr. Stellman.

Q. In 1927 you testified as follows, in the Long interference: "Do you know Elmer C. Long?" answer: "Yes, sir." "Q. How long have you known him!" "A. About nine years. Q. That would bring it back to 1918, isn't that right? A. Yes." A. Well, I said about nine years. Understand when I gave my testimony down there with Mr. Long, I gave it just as honest as I knew I could give it, and I didn't have any records to go from other than memory.

Q. Now, when you said that is the type piston, and pointing to Exhibit 43, which Mr. Richey handed you, which you said you had installed in Mr. Murphy's car in January, 1919, you just merely glanced at that print, didn't you? A. No; I looked at the print and see the design of it. I saw that it was a it didn't have struts in

Q. And you also knew the number P-2912, didn't you? A. No, no, I didn't pay any attention to the number: I was looking at the piston.

Q. But before that you said that that particular pis-

ton had a T-slot? A. Yes.

(Narrative continued) By T-slot I mean they slotted that piston from there (indicating) and ran it into a slot going around here; that is what I would call a T-slot. In other words, I mean a slot just about like shown on Exhibit 3-0, except it is carried all the way through. It had a slot below the bottom ring land, and then another slot extending from the center down to the end of the skirt so as to make a T. That is the kind of piston I installed in Mr. Marphy's our in January. It had webs on the inside here, running from the top of the skirt, the top of the head down along the side of the skirt and opposite this T-slot. That is what I call the type A.

Exhibit 43 shows the T-alot right here; here is a slot on the skirt, isn't it, that red mark "R." That is the way I construe that drawing.

Q. As a matter of fact, that slot on that Long piston which you installed in Mr. Murphy's car was like Fig. 2 of patent 1,595,441? A. That is the slot there; that is the general type of the piston, slotted up and running into a horizontal slot.

(Narrative continued) I don't recall whether or not it had a slot like shown in Fig. 1. I recall this part of it, because we had done our slotting there ourselves; this was different; there wasn't much in the outside appearance of the piston over what we were using except for the T-slot. The T-slot is what struck my eye. That is the one that was later referred to as type A. At that time there wasn't any type A and type B. Later on I feel that that was the type A, and the rib type of the wrist pin boss was type B.

The pistons installed in Mr. Wilkinson's ear in March, 1919, were practically the same as those installed in Mr. Murphy's car in January, 1919. The piston that was brought over by Mr. Long and put in later on in that test that you said was in March, 1919, that is just about the piston as shown in Exhibit F; that is practically the piston; I don't say this was on it, but it is practically this piston, that it had the supporting bosses.

When I say "this was on it" I mean that seems as though it was later on; I wouldn't say it was or wasn't on there, but I know from the first time Mr. Long brought the piston, this piston, we were doing a lot of things to make that successful in production. I wouldn't say that relief was on there or wasn't on there. I wouldn't say that it was the practice to put reliefs on pistons; this piston here didn't have any relief on it (indicating Exhibit 3-0), or this piston didn't have any relief on it (indicating Exhibit B).

As to reliefs on pistons, you had to have some place to expand it, for it to go into, and there was a hugging action going on, if you didn't grind it elliptical, you had to put a relief in there. In other words, you could avoid putting an actual relief by grinding it elliptical. That was done by grinding it elliptical with the short axis of the ellipse on the line of the wrist pin boss; that was done later on in our own plant. That was done before Mr. Long brought the pistons, Exhibit F, there. We had oval pistons in the factory. Now, that was—no, that was

later on, there wasn't any relief on pistons before—there wasn't any relief on pistons before 1919 to my knowledge, not even on pistons like Exhibit B. It was the practice to do that in cast iron pistons. I am speaking of the aluminum pistons. That was done a long time before in cast iron pistons, although we had hundreds of cast iron pistons that did not have the relief on them. I wouldn't say that we did that as early as 1915. I wouldn't answer that question. I know we made a model, in the 20's; it was actually an oval piston, with the short axis along the line of the wrist pin bosses.

(Adjournment taken to 1:30 P. M.)

(1:30 P. M., the hearing was resumed.)

Referring to that Long piston that we installed in Mr. Murphy's car in January, 1919, I don't know whether that was relieved in the region of the wrist pin bosses on the outside. I don't know anything about the relief on the pistons mentioned in the reports of July and October, 1918. I know about the pistons, but the relief part of it, I wouldn't pass a remark about it, whether it had it or didn't have it.

I said that it was my job to make a better car. I was under Stellman Stellman appointed me to that job. Stellman was chief engineer. Mr. Murphy was chief engineer when I was appointed in January, 1918. Before, Mr. Stellman was assistant chief engineer, and I was directly under Mr. Stellman. I reported to Mr. Stellman.

This Exhibit B type of piston was used in the Franklin car engine in 1919, in January, in Mr. Murphy's car. No, I am wrong. This is the aluminum piston that was incorporated in our 9-A, 1916 automobile, the 9-A 1916 model (indicating Exhibit B). It was used for 1916,

1917, 1918 and part of 1919.

I said that the top of the skirt was the area of grief in all pistons. In fact, in all pistons the greatest amount of heat comes from the head, and carries right into that spot, and it is the most rigid part of it because it is directly under a solid head and the wrist pin bosses, naturally, there is just less chance of the piston yielding in that section, that is the point we have to give the greatest clearance. What you want there, you want a piston to grow as it gets warm to fill up the whole interior, to eliminate slap. You see there are two things in the piston to be successful, one of them it must be quiet, the other one it must not score. Now, you give it the greatest possible clearance you can so it won't score; in the

other sense you give it the teast amount of clearance you possibly can so it won't slap. I think that slot in Exhibit 3-0 should be carried down to the end, to allow the piston when it expands, takes up the heat, to expand and pick up so you don't have a high pressure area for wear; you should have a small pressure area for wear. In an ordinary trunk piston that has no slotting in it at all, if you put it in a cylinder it begins to expand from the top down, tries to come out with the big diameter at the top and the small diameter at the bottom, so the important place to have the yield is really at the top of the skirt, gradually tapering down. That is what I meant by the area of grief at the top.

I first saw Exhibit 43 piston today. If that was over in the office, I wouldn't say that I saw it yesterday. I tell you honestly I was tied up with that all day. I won't say I saw it yesterday, I saw it this morning.

A. Was that the one over in the office (addressing Mr. Richey)?

Mr. Richey: No.

Well, I saw a blueprint of that type of piston over in the office, that is down here—that is the first time I saw that.

Q. Do you know where that blueprint is?

Mr. Richey: We have it over in the office, yes. Mr. Bruninga: What is it, the exact thing!

Mr. Richey: I was told it was the exact thing.
Mr. Bruninga: I would be glad to have it. One
of my objections was that it was so faint at the top
of the rectangle we couldn't tell what was written
on there. I would like to have you send for it.

(Thereupon, Mr. Richey sends for said blue-print.)

(Narrative continued) I believe I said that the Long piston that we used later on came to be known as type B, and that is correct.

Q. And that is the one, Exhibit F?

Mr. Richey: I object to that. He didn't say it was like Exhibit F. He said it was like one in the patent.

Q. Was it or was it not like Exhibit F, that type B? A. Well, it was a strut type piston."

(Narrative continued) I don't know as it was any different from that piston Exhibit F. As far as I can

tell it was the same thing. I said that was called a "special Long." They called them "special Long patented." They used to say "Long patent piston," and this was designated as a "special Long patent piston." I believe the one we installed in Mr. Murphy's car was later on known as type A. That had the Talot on one side and the ribs going up the skirt on the other side. That rib interfered with a bolt that held the wrist pin solid to the connecting rod, the clamping bolt of the connecting rod that held the wrist pin rigid. In other words, referring for instance to Exhibit 14, that piston had a rib going down from the head along the skirt, and interfered with the bolt on the connecting rod. That was one of the things that was the trouble with it. Now, they didn't all do that when they were installed, but evidently it was just close enough to that in making its cycle sometimes it would possibly wear, a lot of things evidently clearance was so little that at the beginning they probably wouldn't strike but as the mileage was built up in some of the yielding portions, and it gave, it allowed it to come close enough to hit that. Sure, we filed them, got a cold el and cleared them out, gave them clearance. That worked all right, as long as they had clearance. The interference was a plain mechanical matter. There was nothing the matter with the pinton otherwise, that would be just a matter of the details not looked into closely n they made the drawings so that the enting had greater charance at that particular point. There was just ex. rib down there about at a place at right angles to the wrist pin boss. That piston want't a good piston. because it want't a quiet piston; and it set up. It wasn't as good as the one known as B. I know of no reason why it was better than A; evidently if had greater yielding sibilities, that is all the piston done. The B piston arest thing to being a satisfactory piston we was the m have unid

The type B piston was discontinued in 1928 because it didn't perform as antisfactory as a piston that was introduced by a competing company, known as the Invar-Strut piston. The invar-Strut just beat the Long out on the pistons from the results obtained in the laboratory and in the car, gave a more all around satisfactory piston. The weight is slightly, possibly a little bit more than the Long, but it wasn't a factor. We thought more of an all around satisfactory piston than we did on any onness, it would be a small number of ounces or fraction of ounces.

that would be the difference in the weight.

In 1928 when that Strut type piston was adopted, the power of the engine was increased comewhat; they made a bigger motor. That motor was for the 1929 model, and tested in 1928. The service of a piston was comparable to everything else that was in that engine, more subject to grief on the road, bearings and everything, high power engine. It wasn't necessarily a high

speed engine.

We had some trouble in scoring of the Long pistons just about in the plane where the webs run into the skirt, on the thrust side of our engine, or on the exhaust side, as we called it that is on the thrust side opposite to rotation; that is where the scoring, 99 out of 100 occurs in the pistons, on the thrust side. In the Long piston it usually occurred back of the webs, I don't know what was taking place in the piston. That is something-it always did the maximum scoring, you could see the strut, even when we made the webs as thin as shown, for instance in Exhibit F, it would still score. The scoring was always back of the strut. Exhibit F piston, right there, was approximately the Long pinton that we used in 1928, only in another size, greater size.

I wouldn't say what was going on inside of the pis-

ton when it scores and don't score because here is the funny part of it; you can have the same piston in another motor and be out and do just as hard work and it won't score in the same relation on the cylinder; or, another matter, it may be number 5 will score and on another

motor it will be 2.

a lenteness averaged and av What we started to use in 1928 was a piston like Plaintiffs' Exhibit 41; it had a little wider strut, practically the same thing, though. That didn't have any webs in it; there wasn't anything that could push out. The scoring in the Long piston was directly back of the webs. I wouldn't say that would cause the scoring, and I wouldn't limit myself that way.

Going back to Mr. Murphy's ear, in which the Long

pistons, type A, were put in in January, 1919, the cylinders were badly worn. It wasn't a fair testing of the piston. There was things on the eagine or incorporated in those cylinders, possibly a valve guide or maybe the fine were embedded deeper in the iron, or comething that evidently they wanted to earry that test on with those cylinders rather than take them off and put on new ones. That would be my assumption or reason the new cylinders weren't put on at the time the pistons were put on.

I won't say anything about the tests in July an October, 1918, with the type A piston, other th I read in those reports. I have no independention other than what the report says of 1918.

I know we put Long pistons in Mr. Murphy's car because they came to me, as they always did whenever there was any work given to me, that would always be given by the head in that department, you might say Mr. Stellman or Mr. Murphy or somebody would say "John I want you to put these in so and so's ear." There would always be a slip on there, like a working order, maybe it would be written in pencil, just as an ordinary note, and when I completed that job, when that job was done, I supervised the work and took the car out and tested it so that the car would be satisfactory for the officials to drive that, to take with them or to go home with or to

Mr. Wilkinson's car had that model A piston put in it on March 8, 1919. That car, I wouldn't say how it performed because as a rule Mr. Wilkinson, he was vice president and he was the big man in the plant, mechanically in the management, as far as the building of the car, and he was the kind of a man that he preferred to drive his own car and break them in; nine times out of ten if I had a job for Mr. Wilkinson, he would get in the seat and drive off, he wasn't a bit fussy if it worked on four cylinders, as long as he could go as fast as he wanted to. He always wanted to go fast. He didn't care anything about an automobile that was nice and quiet and anything, he always wanted speed.

Mr. Bichey: We now produce for examination of councel the blueprint he asked for, which the witness said he saw in our office. (Producing blueprint.)

(Narrative continued) Mr. Wilkinson made no com-

plaint to me about the pistons in that car.

Referring to the sales department demonstrator which we fitted up with Long pistons in the middle of March, 1919, we took out of that car a set of those T-slot, type A. pistons. As to the pistons that Long said "I have pistons here that won't set up," they didn't set up; they were beautiful, when this trip was completed, about 900 or 1000 miles on them, this car was pulled down after I made the installation, and they were all in fine shape.

We didn't start to use Long pistons right after that; there was a lot of work done; that was the beginning of the testing of the Long piston of the strut type. In other words, there wasn't anything else in the picture then around that experimental department to any great extent except that Long piston, and that gradually worked into production, because it was the first honest, successful tests they ever ran on aluminum pistons on a motor that was good. That Long piston was the first piston that was quiet and would go out and do a real day's work.

Mr. Richey: Which Long piston were you re-

ferring to in the last answer!

The Witness: The type which had the struts, like Exhibit F.

(Narrative continued) We started to put those pistons in production after this test, in the fall or winter of 1919; they started machining them up and making molds; we were putting them in official cars, cars belonging to Syracuse people, in other words, we got them in as many car owners' hands as possible, to get the reaction from them the way they sounded and the way they performed; and that gradually led to production. Before that the Service Department took some of them service, you know, never specifies as being adopted until production actually adopts it; but they were sent out into service for reasons of getting as many as they could into the hands

of the owners.

Those pistons went into the service department in

the spring of 1919 only as an experiment.

I never had anything to do with Long dealers.

Q. You don't know whether the Long dealers were using them as early as 1918!

Mr. Richey: You mean to ask him about Franklin dealers?

Mr. Bruninga: I mean the Franklin dealers, yes.

A. Yes, we offered those anywheres I was sent. I wouldn't go to the dealer but we always had a number of dealers that we could rely on, in fact they would have in their service organisation a Franklin trained mechanic, and I could send things to them. I used to send pistons, valves, spark plugs; if anything acted good in our tests and we wanted to get a reaction from the field I would send them out to the service department I knew would give me a good honest opinion. I sent them to Chicago, Pittsburgh, several areas we could get some

good testing done. I wouldn't say St. Louis, although we had a fairly decent dealer out there. The places we worked in was places where there was hills, because you could drive pistons in a flat country where they wouldn't show up like a kill climbing, long sustained hills would bring out, hill climbing with wide open throttle would bring up the heat and cause grief where fast driving on the level wouldn't do it.

(Narrative continued) I believe William Venner was part of the dealership in St. Louis; I think his job was service manager. I saw him in Syracuse a year ago, probably, maybe a year ago this time. I don't believe he was doing anything.

I didn't know that Venner was using Long pistons

in 1918 for replacement in Franklin cars.

I have gone through these peports thoroughly that are before me on the chair. The first mention I claim of Long pistons occurred in July of 1918 in the report, Exhibit 42 B, on the third page. That is the first report

where the Long piston enters into the picture.

I came to Cleveland, I got here a quarter to eight yesterday morning, 7:45. I spent the day going over the reports. I discussed this matter yesterday with Mr. Edgerton, who is with Richey & Watts. I got my information and of course I had it in the background, all of this stuff I am telling you today, of meeting Mr. Long and making the installation, but to get the facts up to date I consulted those reports there. If went over this matter that I have been testifying about today with Mr. Edgerton.

I did not bring this bineprint, F-2912, with me. II saw it over in Richey & Watta' office. There is noted on it is red "MD28"—some number on there with an X or something back of 28. "MD80-X": "MD28- is that

an 8-280."

"280-X" does not mean a thing to me. On the upper right-hand view also appears some red marks, but I don't know what they are. I don't find them on the photostat. I guess this blueprint belongs to the Franklin Company. I don't know what that mark is below "D. R. Clark"

I notice on the blueprint "6AL58" and right above that symbol there are lines which seem to run up into a little part. I couldn't tell you whether there might be something noted above on the original. That also shows

faint the same way on the photostat.

Mr. Bruninga: I just want to identify these matters on the photostat, so that I can return this blueprint to Mr. Richey.

Mr. Bichey: Well, we will offer it in evidence

if you think it is important.

Mr. Brunings: Yes, you can offer it in evidence;

I would like to have you do so.

Mr. Richey: Well, I offer it in evidence as Plaintiff's Exhibit 46. I do it reluctantly because I am duplicating the record, but on account of the question that has been raised by defendants' counsel.

(Narrative continued) I did not search the records at the Franklin Company before I came here. I was

called to come here.

I am not drawing any money from the Franklin Company at the present time. The last time I drew any money was just about election, I had a special assignment on an army job. You see we have Franklin motors in army service, that is cavalry, on armored cars, trucks, commanders ours. I was with them on the original con-tract on the reorganization forces and they wanted me to go down there and give them a pep talk to get them interested to buy Franklin motors, but the army isn't. buying motors.

I am still un employee of the Franklin Company.

I have no independent recollection of the experimenting that was done with the Long pistons in 1918, nothing but what is in the reports. My first contact with them is supervising work in January, 1918. It don't remember that I operated a car with Long pistons in it in October, 1918.

Q. In that Long interference you testified as folhaving Long pistons in the motor? A. Yes, sir. Q. In what month was that? A. I would say the same month as I feel that Mr. Long and I first met, October, 1918.

Q. How do you fix the date of October, 1918, as being the first time you met Mr. Long? A. I know from the model that we were working on, or series we were working on, and the length of time it was in production. Q. Do you rece? what the name of the series was? A. Yes, series 9.B." You testified like that—counsel will tell you—in that case? A. I probably testified. Yes, I said it was around the water of 1919 and it could have been in October, it may have been in March, of 1919.

(Narrative continued) When I testified there, I will say something maybe you won't like-It was in the winter of 1918 or 1919 when I said what is in there, but it was, you might say, just trying to recollect the events, but actually what I am testifying today is what I got out of them books when it was; it was in the winter time, the winter of 1918-19, that is, it carried over. You get what I mean? Now, I said three mouths this way in that report, and I am enving about three months this way in this report, 1918-19. In that case I testified about, I didn't have a thence to look at records. Now that I have a chance to look at the records I go by the records ab lutely, rather than my recollection.

They promised they would pay my expenses and give me something, give me my salary, for coming here. I am not working, I couldn't afford to do it therwise.

Mr. Brunings : That is all.

Re-Dency Reasuration by Mr. Richey.

When I testified in the interference case I didn't use the records before I testified. Since that time I have consulted the records. I will tell you why, if you want me to say it right in here. I would like to tell you why, beto say it right in here. I would like to tell you why, because I was always later on the Long pisten installation than anybody also, and this enying it from just memory, I made up my mind I wasn't going to do it. The records have absolutely refreshed my recollection and memory.

Q. Nov, in your testiment in the interference you exid, we asked what your it was that you drove those Long pistons, and you said: "I would say the same month as I feel that Mr. Long and I first not, October, 191821

Mr. Brusings: I don't think it is permissible for counsel to dispute his own witness, which he quotes the same part I am quoting from

Mr. Richey: I am not disputing, I am giving him a chance to keep you from confusing him, getting

him balled up.

Mr. Bruninga: Oh, never mind, go ahead, Mr. Richey.

(Narrative continued) I say that in January, 1919, was my first contact with the Long piston by Mr. Long. Later on it was Mr. Long. but January of 1919. Later on it was Mr. Long, but January of 1919 is my first knowledge of the Long piston, actually where I had something to do with it, but the reports showed in 1918, July, but I had no work connected with that; the reports have given me that information.

Referring to Exhibit 43 piston, I will mark an X on the slot that I referred to as a T-slot. It was right there.

Q. Now, will you merit it on these other ones! A. It would be over here.

Q. Do you see it there in the drawing, the T-slot you refer to! A. Yes, I can see this one right in here.

Q. All right, mark it right on that, will you? A.

(Witness complies.)
Q. New, do you see it on any of the other views? A.

I don't know as I do.
Q. Now, where is the rib B on this piston shown on Exhibit 43? Will you mark that with a Y? A. This rib here, you mean?

Q. Yes, the one you referred to. A. (Witness com-

Q. In the other figures where is that? A. That ald be this rib right here. It is not on there, though.

would be this rib right here. It is not on there, though. That is the only place you can see it.

This Exhibit F piston is a lot like the Long pistons that I put into an engine in March 1919 because it is a sand east piston, but I can't say whether or not the pistons of the original installation had this relief at the wrist pin bease. When I said the Exhibit F piston and the Long pictons installed by me in March 1919 were allie, I didn't mean with respect to the relief. I told this pustlemen over there (Defendants' Counsel) I wasn't sure the relief was on or off.

Ra-Chaile Brancasson by Mr. Brunings.

Beforeing to Enhibit 43, this view on the left, reading the short with 43 and the restaugle at the left down, this view at the left is a cross section taken right through the wrist pin boss.

Q. Now, what is this line over here which I will mark? A. That would be one of the slots, top slot.
Q. That line that I have my pencil right on new? A. That I think would be a continuation of this one right here; in other words, that slot there would run into that portion of the head right there.

Q. Will you put a mark "N" at the part that you said was the top? A. You.

Q. The top of the T, isn't that right? A. You, that

88 0 .

Q. Will you point to me what was the vertical of the

Q. You mean that line that I have marked "M." is that right? A. Yes; that would be the same slot carried

Q. And that elet ran from the bottom of the piston

right into the slot "N," is that right? A. Yes.

Q. How far around did the slot "N" go! A. That went all the way around, I am pretty sure.

Q. All the way around the piston! A. Yes; I wouldn't swear to that, though, either.

Q. I think you said the top part of that slot was more like the one- A. I won't eay that elot went all the way around.

Q. -shown in the Loug piston? A. Yes, like on

that ord

Q. Like on Fig. 2 of the patent 1,394,441? A. Yes,

Q. And then on the opposite side from the slot there was this rib, there was this rib that you marked "Y" that runs in a detted line from along the skirt and into the top of the head? A. You.

Q. In that right? A. You.

O Is that right? A. Yes.

O And there was just one rib in the center? A. re was that one rib enried up here.

O And the vertical of the T— A. Probably right here right up to there.

O At the point that I will mark "M"? A. Yes.

slotted part of the T around the pi

(Narrative continued) T never heard of the Long on well 1919. The records tell on the picton was ed in 1916, in July, but I have no personal recollection hat 1916 test. I had nothing to do with these 1918 o with these 1918 Contests were the

then: That is all N 198 and the self Cyan

all artisticated and

These two parallel lines marked "A" on Exhibit 43 to the a relief for the wrist pin bosons, but I don't ice any relief and I can't see that there is any. I these what these two parallel lines running down there are.

os two parallel lines which you have marked "B"
o a clot in the piston?

Q. Will you compare the two parallel lines shown at B with the two parallel lines shown at A?

Mr. Brunings : That is very clover leading, Mr.

Biohay, I must say.

A. Icem't.

(Narrative continued) I don't know what is shown by the parallel lines at A; I can't dope out that. The parallel lines marked C in the bottom view look like slots.

Q. Now, are those lines shown in the view above the

one that I marked Fig. 51

Mr. Bruninga: I will let you go ahead, because I think you will fall into your own trap.

The line C looks like a slot to me. Fig. 4 doesn't show it. This looks like the bottom of the piston to me, Fig. 5. What is this? This is supposed to be the bottom of the piston looking down?

Mr. McCoy: That is looking up from the bot-

tom.

The Witness: Like looking down through here (indicating on physical exhibit)?

Q. Yes. A. Well, it looks as though those were slots that appear in the end of the piston, these here."

I don't know how they designate those slots on the piston, I just took it for granted that was a slot and this was a slot. I said X was a slot, and that B is a slot. was a slot. I said X was a slot, and that B is a slot. X. B and A look all the same to me; they look like slots; they look like saw marks on the piston. There is not anything on this drawing that leads me to believe there is a slot at M, but that is there; I guess that is the center line. The line I marked W in Fig. 1 and a mark in Fig. 3 is a center line. It doesn't look like a slot.

Q. Now, as a result of looking at the drawing closely will you state whether or not there was a slot at M in that piston?

Mr. Bruninga: I object to that, now, your Honor, I think this has gone just about far enough.

The Master: Yes, I sustain the objection.

When I say this is a center line at M, it looks like a line drawn down through the piston, that is all. By "center line" I mean, looking at the piston that way, a line out right down through there, brought right down through that dimension.

Q. Would the center line show up in the piston it-

Mr. Bruninga: I object again to it as leading.

That line M don't look like it is a physical part of the piston. The purpose of the center line is for setting up their work, of making a drawing on that particular paper, as an aid to the drawing.

RE-CROSS EXAMINATION by Mr. Brunings.

Having reference to the type A piston, and Fig. 2 of patent 1,395,441 and Figs. 1 and 2 of patent 1,489,499, if I recollect the piston, it looked like Fig. 2 of patent 1,395,441. I don't have any memory at all whether it looked like Figs. 1 and 2 of patent 1,489,499.

Mr. Brunings: Those patents are in the record. That is all.

Mr. Richey: How about those records (H. H. Franklin Development Reports), do you want to look

them over?

Mr. Bruninga: No, I don't want to look over those records, I haven't got time for that, and besides they are not direct from the Franklin plant at all; I don't know where they have been between the time they have reached your office.

Mr. Richey: I will have to put Mr. Edgerton on

Mr. Richey: I will have to put Mr. Edgerton on for a few questions before we go ahead with Mr.

Guliek.

A. H. EDGERTON, a witness called in rebuttal by Plaintiffs, being first duly sworn, testified as follows:

DIRECT EXAMINATION by Mr. Richey.

I am of mature age and a member of the firm of

Richey and Watts.

I went to the Franklin plant recently, and I saw there, first, the patent attorney, Mr. Bodell, received his permission to go into the Franklin plant, and there I met Mr. Castor. Mr. Bodell accompanied me to the plant. I met Mr. Castor there and we went up into the engineering department of the H. H. Franklin plant, at Syracuse. Mr. Castor made a search for the records, the records which we have before us here in the court room. I was present throughout his entire search. The search lasted the greater part of the foreneon and during the time we had Mr. Chadwick, a former employe of the Franklin Company, come in, and he also searched, and these records were developed in that search. I mean the mechanical and experimental records which we have before us, of which Exhibits 42-A, B and C, and the remainder are on the chair there before the Court. Those are a part

of the records found by Mr. Castor. The remainder—they started, I think the first year was 1910; they ran up to 1932, inclusive. These are records from 1916 to 1919, both inclusive. Those are all the records they found for those years. After they were found, Mr. Castor ast down at the table and looked through them. I sat at his side and as he would finish them they were passed to me and I made a cursory review of them and then I brought them to Cleveland with me. I brought to Cleveland with me all the records Mr. Castor found for those years. These records that I have produced here, are all the records that I brought, including the three that have been separated therefrom which are marked A, B and C.

Mr. Richey: That is all.

Mr. Bruninga: No cross examination.

Mr. Richey: It may be understood we can send

those back that are not offered in evidence?

Mr. Bruninga: Yes, you can do whatever you want to.

Thereupon, the Plaintiffs called as a witness in rebuttal, EDWARD J. GULLOK, who being first duly sworn, testified as follows:

DIMEGT ENAMINATION by Mr. McCoy.

My name is Edward J. Guliek; I am 63 years old.

My residence is Elkhart, Indians. I am now engaged in
the manufacture of automotive specialties. I worked
with the Amplex Motor Car Company, Mishawaka, Indiana from 1906 until shortly before the 1st of September,
1910. My position with that company was secretary and
general manager for that company in 1908. The Amplex Motor Car Company were manufacturers of four
cylinder, two-cycle automobile engines.

Shortly after the lat of September, 1910, I went with the Excelsion Motor & Manufacturing Company, Chicago, as Factory Manager, and remained with them until shortly after the lat of November, 1911. This company manufactured automobile motors, motorcycles, and bicycles.

After leaving the employ of the Excelsior Company, I was in the East a big portion of the time engaged with a man by the name of Pulsifer for a period of two or three years in an attempt to establish another automobile institution, and just prior to my going back to Mish-

awaka with the Amplex Company in 1912 to 1914, we were engaged in an attempt to raise enough money to buy the Amplex Company from the receiver. We finally accomplished our purpose, and we went into operation in the factory about the first of 1914, and I believe we gained possession through the receiver along about June or May, 1914. We were working at the factory prior to taking it over from the receiver. I was at Mishawaka during that period. That was the factory of the company with whom I had worked in 1906, that is, the same factory and same name. In 1914 we operated under the name amplex Motor Car Company, from about the first of the year 1914 until November, 1914, when the company went into the hands of a receiver again.

Some patents have been issued to me, and to the best of my recollection the subjects varied from bicycle to automotive—musical instruments—special machinery—I would say at the very least 50 patents, I don't

know the exact number.

There made some piston inventions. The first elected of piston I made was in January, 1911. This was a piston with a slot going around the top, and a split skirt, and ribs extending from the head down to the piston pin bosses. The piston pin bosses weren't connected to the skirt but the ribs were connected to the skirt. The idea of this piston was to permit it to collapse under heat so it wouldn't seize; that was the object of the slots. This invention was made prior to 1911, the latter part of 1908. The circumstances surrounding this invention were, our two-cycle motors were large hore and we had a great deal of trouble with piston slip and piston seizing because of the creesive heat in the two-cycle cagine, and I conseived the idea of slotting the piston to get rid of that difficulty. However, I found out it went t practical with the two-cycle motor, with the slot at the top and slot at the side, because of not covering the flort holes, there were no valves in the two-cycle angine, and the slotting of the piston would interfere with the operation of the motor.

I next became active with my invention in January 1911, at which time I made a sketch of it. I place this date through the fact that my wife and I want to Syracuse through the holidays, and we returned the second day after New Years, to Chicago. I made a sketch of it-during that time and showed it to her, and in the last week of January, 1911, she went to Florida and didn't

return until about the latter part of April. I made a partial description of that invention at that same time, which I showed to my wife. After my wife went to Florida, I wasn't home a very great deal, I took my meals downtown, I lived in Englewood, and it was very seldom while she was away that I got home before 11:00 or 12:00 o'dlock at night. For that reason the description wasn't completed but remained as a sketch until later on; and it remained in my possession until it was turned over to either Pond or Tibbets. I also showed my wife the drawing of my invention at the same time I showed her the description. I believe I could reproduce at this time the characteristics of the piston that I showed in that sketch.

(Thereupon, a short recess was taken while the witness reproduced the sketch.)

Mr. McCoy: The witness has produced Exhibit Drawing, Plaintiff's Elzhibit 44.

(Narrative continued) Part I of the piston shown in Exhibit 44 represents the head of the piston, 2 the skirt, 3 the ribe, carrying the houses 4 to the head 1. 4 are the piston pin bosses, 5 the slot. The slot 5 is located just below the lower piston ring and extending discumferentially around the piston, 6 the diagonal slot which aplita the skirt, dotted line 7 represents ribe extending to the presents side of the skirt opposite from the slot 6. The ect in showing this was to make it possible to use what is known as the shoe-type cross-head with the bearing surfaces on the pressure side only. The pressure side in the side which is forced close to the wall or tightest to the wall under the explosion, under the firing of the engine. It probably would also be called the explosion thrust face of the piston.

I would recognize the sketches and the descriptive matter that I made in 1911.

Exhibit 36 is the sketch which I made in January. 1911, and Exhibit 37 is the incomplete description that I made in January, 1911. Ekshibit 37 is a description of the pistop sketch Plaintiffs' Exhibit 36. I recognise the sketch Exhibit 36, and the written descriptive matter, Exhibit 37, because I doubt if anybody would make a sketch like myself, and of course I know that it is my own my own work, also my signature appears on it, and the descriptive matter is in my handwriting.

Referring again to Plaintiffs' Exhibit 44, on which

I have shown a dotted line marked with the numeral 7,

that was a modification of the piston shown. I find the same modification shown in my sketch Exhibit 36. Explaining more in detail the character of that modification, that was for the purpose of constructing a piston with ribe extending only from the boss, from the piston bosses to one side of the skirt, that is the pressure side, and the idea being that more contraction of the piston by so doing might be possible, or would be possible. This construction merely was a modification of the original sketch, on the original sketch.

The descriptive matter identified as Plaintiffs' Exhibit 37 reads as follows:

"Relating to an engine piston which provides for and prevents seizing, binding and scoring when hot or oversize. It is a well known fact that all engine pistons are necessarily made smaller than the cylinders in which they operate to provide for lubrication and prevent seizing or cutting due to the expansion of pistons in cylinders when hot. (1) the piston consists of a head 1, and having a groove 6 for carrying packing rings and a body 2, which provides bearing surface and which is split as indicated by 7, to provide for expansion. (2) The head 1, and the body 2, are held together by the ribs 3 and 4. The ribs 3-and 4 carry bosses 5 for receiving the piston pin. Ribs 3 and 4 are not limited to shape or position, and the number of ribs and location and shape may be altered as desired. Head 1 is machined small enough to allow for expansion and not bind or seize, while the body 2 is machined as close to the size as is possible to make a fit, and any expansion is taken up by the elot 7, and which prevents any seizing, or binding between the pistons and the cylinder walls in which the piston moves. By this construction it is possible to make a fit that prevents any pounding, which is prevalent with the common type pistons."

The purpose in writing up that descriptive matter

was to apply for patents.

The Mr. Pond to whom I referred was a patent attorney in Chicago. This is the paper that I referred to as being submitted to Mr. Pond. These papers, Exhibits 36 and 37, were in Pond's possession and were returned to me in the early part of the year, I believe in February of 1916. At that time I sent them to the Packard Motor Car Company, because I was negotiating with the Pack-

ard Company for the sale of a number of old patents, and the piston, this piston, this type of piston, with some other inventions which were not in the Patent Office, were wanted by the Packard Company, this piston was amongst the exhibits shown as an exhibit. A lawsuit which I had with the Packard Company led up to the submitting of these particular papers to the Packard Company. This suit was for royalties on some patents which I owned on their rear axle construction. I don't remember when that suit was brought, but it was between 1912 and 1914

In order to try out this invention after the sketch was made, I made up a set of pistons and put them in an Excelsior motor in 1911, of the four-cycle, four cylinder type, and drove them on the road. I made other tests at that time. There were two sets of pistons made, one to be used in the car and one to be used on the test block. The pistons were tested on the test block; I didn't test them personally. Those were the only two tests made at

that time, in the car and on the test block.

That piston which I sketched up was designed particularly with the idea of making a perfect piston for the

purpose of applying it to a sleeve motor.

Concerning the character of test that I made in connection with the use in the automobile, the car was a Renault type, experimental, and made up by the Excelsior Company. The motor was an Excelsior motor. The pistons were standard Excelsior pistons and were slotted on one side only just below the lower ring, and then split diagonally to the bottom of the skirt from the slot. My instructions were to have the pistons split in the tool room by Mr. Johnson. He did only part of the work and the other portion was done by a man by the name of Engle in charge of the experimental department. The piston used was a standard Excelsior piston secured from the Excelsior Company. The piston was taken out of stock; I purchased the pistons but they were taken out of stock. Those pistons were fitted in the cylinders very close. I don't know the man's name who did the fitting, but the pistons from the Excelsior Company, I might say, owing to the variation in the bores of the cylinders were carried in stock rough turned, rough finished, as in many cases we had to grind pistons oversize or undersize to make up for this difference. These pistons were selected for this motor and ground to size of the cylinder, very close fit. By very close fit, I mean they were fitted so that they could just be moved through the cylinders by hand and sustain themselves when dry.

The part of the machining of the piston which was left uncomplete, as I have testified, when the piston was brought to me by Mr. Johnson, was the vertical plot. The slots had been milled or cut in from between the two bosses on one side only. I didn't receive the piston; it was turned over to the experimental department and Engle cut the angular slot from the top slot that they

Engle cut the angular slot from the top alot that they milled in the skirt. Those slots were ent clear through the skirt. We made no change in the atructure of the standard type of piston other than the slots.

I have since made up a piston of the same general character to illustrate the type of piston that I made at that time in 1911. That piston was made in 1914 at the Amplex Motor Car Company. There were only two sets of pistons made in 1911 but I never made up any after that. There was a piston made up for your (Mr. McCov's) was in the interferences, according to my statistics. Coy's) use in the interferences, according to my abotches,

according to my ley-out.

II (testified in Patent Office Interferences 49,569, 49,570 and 49,571.

I would recall the standard type of piston that was being used by the Excelsion Company in 1911 when I was with them, and would recognize a blueprint showing that piet

(Witness handed blueprint marked Plaintiffs' Balifet 45.)

I recognize that bineprint, Plaintiff's Exhibit 45, as a print of the piston need in the Excelsion motor in 1911. That is the character of piston that I modified in 1911, as I have testified. If would recognize the piston itself if I saw it.

(At this point the testimony of Burns, Record pages 674 to 698, and Edgerton, Record pages 698 to 699, was taken.)

(Thereupon, Rowans J. Guller, being recalled fur-ther testified as follows, in answer to interrogatories by Mr. McCoy.)

My position with the Excelsion Motor & Manufac-turing Company, at Chicago, Illinois, was Factory Man-ager, and I had factory drawings from which to make up the parts of the standard motors for the Excelsion Com-pany. Those drawings were under my supervision. I would recognise bineprints from the standard factory production motor drawings. net of those has been un

(Witness handed a blueprint marked Plaintiffs' Exhibit 45.)

That print Exhibit 45 is of the standard Excelsion motor piston. Without examining that print, I don't remember whether the skirt of the pistons for use in our standard motors was ground absolutely straight or not. There was some elegrance on the head, of course, from the lower ring up, but I don't remember just how much clearance was given. The blueprint of the standard motor piston would show me how it was ground. After examining this blueprint, Plaintiffs' Exhibit 45, I find that according to this print they were ground .002" taper from the bottom end of the skirt to the top of the piston head. According to this print that was a uniform taper. That is my recollection as to the way they were ground, because that was attendard, whatever this print shows was standard constructon; they were ground according to this print. This print accurately shows the character of piston that I said was modified for my test purposes in 1911. I would recognize one of the pistons that were used in the Excelsion motor as standard equipment at that time.

(Witness handed the piston Plaintiffs' Exhibit

I would say that thin is a fair specimen of the pistons need as standard equipment in the motors manufactured by the Excelsion Motor & Manufacturing Com-

pany at the time that I was connected with them.

Some time ago I prepared for you (Mr. McCoy) a piston that was modified to make it the same as the pistons I tested in the motors at the Excelsipr Motor & Manufacturing Company in 1911. If don't recollect what your that was it must have been along in—I can't, I don't remainer that your that was It was at the time the evidence was taken in South Bend, at the time the testimony was taken, about that time.

By Mr. McCoy: I hand you a piston marked Plaintiff's Exhibit 48, and ask you how this piston compares with the one that you used for testing purposes at the Excelsion Motor & Manufacturing Company in 1911?

By Mr. Brusinga: I would like to make an objection. This particular construction is utterly immaterial to the issues of this case as far as the Gulick patent is concerned. My position is that it is

not contemplated by the Gulick patent at all, by the claims in connection with the specifications, and therefore I want to make this objection. Your Honor can see what the construction is.

The Master: What do you claim for it?

By Mr. McCoy: Our claim is that this was a part of Mr. Gulick's tests that were carried on by him prior to the time of filing his application for patent in order to test out his ideas on that piston.

Mr. Bruninga: Will you tell the Master whether you consider this construction coming with-

in the scope of the Gulick patent?

Mr. Richey: Why, we will not say on that subject at this time. We ask the question to show the activity of Mr. Guliek on these pistons, and it is competent at least as corroborative of the other work he has done.

Mr. Bruninga: I want counsel to state his position right now whether he considers that construction within the scope of the Gulick patent.

Mr. Richey: We decline to state it.

Mr. Bruninga: Then it is utterly immaterial to the issues of this case.

Mr. Bithey: It is material at least as to the activity of Mr. Guliek on these pistons, and it is corroborative of the work he did.

The Master: I am not passing on it yet. How can it be material if it is something else he was doing long before he made his application and before he was doing work on this particular piston?

fore he was doing work on this perticular piston?

Mr. Richey: Well, very often this kind of work is unusually competent to show how the man works up to a certain thing, and it is a certain thing as evidence that he did do that thing. For instance, often an inventor will do comething that is a failure, while the fact he did that is competent evidence to show how he worked up to the thing that was a success.

The Master: I am not so sure about that, all of his failures, whether you can bring those in.

Mr. Richey: Well, I am not saying this is a

The Master: I understand.

Mr. Richey: Very frequently in taking this prior invention testimony you put in evidence of what the man did to show how he worked up to the thing that was finally relied upon.

Mr. McCoy: May it please your Honor, this witness has already shown he made eketches in January of 1911 and that these experimental tests were made subsequent to that and along the lines of the invention that he showed in the sketches; he has already testified about those made by him in January of 1911, together with the descriptive matter relating to the same structure shown in the sketches.

(Further argument had.)

The Master: I think I will receive it over the objection.

The Witness: It is the same.

(Witness handed piston, Plaintiffs' Exhibit 48.)

That piston came from the Excelsior Motor Company. I don't remember just where that machine work was done. I believe that was slotted in South Bend, but I don't remember who did that. It was done under my direction. It was done for the purpose of showing how the pistons that we put in the Excelsior Motor were slotted.

Q. Did you try to make that as nearly identical to the piston that you put in the Excelsior motor as you could?

Mr. Bruninga: Object to that as leading.

The Master: I think it should be sustained as to that.

Q. What was your purpose in making that piston at South Bend 1 A. Well, to show how the Excelsior motor pistons were constructed.

(Narrative continued) After the pistons were slotted for me at the Excelsior Motor Company, as I have here-tofore testified, they were installed in the Excelsior motor and put on the experimental block, run for several hours and the motor was then installed in one of the Excelsior Motor Company's test cars. That car was driven by me from the latter part of July until just prior to November 1st. In fitting that piston to the motor, there was no specified clearance given; they were ground just as close before they were slotted as they could be shoved in dry by hand and be moved through the cylinder walls. After that operation was completed, they were sletted, and then they were installed in the motor under my instructions. I didn't put them in personally. I did not see them put in. I saw them outside of the car; I saw them

when they were finished saw them just the time they

were preparing to put them in.
After the motor having these pistons in it was installed in the ear, it was driven to the Eigin races; that was in the latter part of July, as I remember, that is the first day they were ever driven in the ear. After that I drove it continuously until, I balleve, the latter part of drove it continuously us August or the lat of shaft in the our. The same the

with me to the Elgin races wife and a new by the name at was the Morris Engle that a having slotted the pistons

in on these pistons during that sid in which these pistons were very taken out. The other tests

site of it? A. Well, they ren

hid you observe as to the fact as to how to mas! A. Well, there was less slap in id, not so much, and there

pistons fitted, if you recall! A.

e as in the enry very close fit.

(Marrative continued) After these pistons were tested The Breekier Motor Company quit making motors and we were instructed not to make up any more parts and dispose of everything that was on hand; and these pistons were taken out of the car, other ones put in, as I say, it was sold, and the test motor used, an old motor that we put these in, usual type of sylinders on, and those pistons were taken out of that motor, and it was sold along with the rest, and the pistons were in the experimental room up until the 11th of November when I left there, and I never saw them after that.

I carried on other experimental work with eletted pistons for motorsycles while at the Excelsion Company. That test was started constinue in the letter part of May, and those pistons were very light construction, were used in an air-could mater. They were very limitar and

seter. They were we tion, and the result was this, but much rice, and the result was that being a motor, driven up around close to 4000 high speed the pistone didn't stand up, a loose at the toes, the piston pin boss.

nine the Excelular Matarayole pistons

es is handed piston marked for identifica-iff's Exhibit (0.)

struction as was tested

to the Court just where you

his bicognist as a print of the Receision I will make a mark on the binoprint stign of the slotting that was made by ated out at Exceler

(Witness makes mark with red pencil on ex-Milit)

I will also indicate the position of the horizontal slot in the top view of the pisten shown in the blueprint,

AREA CORE OF A TRED CONTROL OF THE TREE CORE

I will put it on this half nide, because that is where it belongs, only it would have to extend across, if it was the full view.

(Short recess taken.)

I have never been connected with the testing or manufacturing of a motorcycle at any place other than manufacturing of a motorcycle at any place other than the Excelsion Motor & Manufacturing Company. I left their amploy on November 11, 1911, because the plant was in the hands of a creditors' committee and was cold to a bicycle manufacturer by the name of Schwinn. They continued the manufacture of motorcycles and bicycles, but abandons, the manufacture of Excelsion motors. With respect to the testing of the slotted platens, there was nothing done in the way of making other pistons was nothing done in the way of making other pistons until in 1914 at the plant of the Amplex Car Company at Mishawaka. On that occasion we were designing and preparing to build a new sleeve valve motor, and in that motor was incorporated a piston of mine of better mechanical design in order to carry out further the experiments that I had tried out at the Excelsion Motor plant. We put a set of similar pistons in a Buda sixplant. We put a set of similar pistons in a Bode six-cylinder motor that was used in an Amplex ear; they were made of aluminum. That experiment was for the purpose of finding out what effect the slotting of the piston would have towards benefiting or stopping the seizing and outting and relieving the high wall pressure. Reverting again to the motorcycle test that was made of the Excelsion, I cannot exactly recall how the motorcycle piston was ground, but I believe it was ground with a very elight amount of taper. The draw-ings would indicate how it was ground.

oferring to Plaintiffs Exhibit 50.)

This print shows taper of 201" smaller at the head end than at the bottom of the skirt.

The costings for the pistons that were tested at Mishawaka, as I testified, were made at the Rockhoff factory at Mishawaka. This foundry was located right scross from the Amplex Motor Car Company, and the material from which these castings were made was aluminum, manganese aluminum, supposed to be magnesite and aluminum.

and aluminum, some mixture.

Reculling the details of obtaining those castings, the patterns were not our property. I believe they were secured either from the Backboff Foundry or else from a man by the name of Williams, who did some experimental work, and they were practically the same size and

same dimensions as what we wanted with the exception of diameter. They were pasted up with a pasteboard around them in order to get the piston of proper diameter, and the core box was a single rib core box that was changed to double rib. Standing from the piston pin boss to the top of the box. Then the piston, in machining the slot, was cut completely around below the lower ring through to the two ribs which extend down from the head, just through to the ribs, so it carried the skirt clear around, and just to the ribs; and it was slotted diagonally, the same as on the Fixedsion job. Explaining more in detail the position of the diagonal slot referred to by me, the diagonal slot was on the compression stroke, not on the pressure side. The diagonal slot with reference to the piston pin bosses, extended from the slot which was around the piston, above the bosses to the bottom of the skirt. I think I could reproduce in a drawing fairly closely the general character of that piston.

(Witness is asked to reproduce in a drawing the general character of that piston, and is handed blank sheet marked Plaintiffs' Exhibit 51.)

Mr. Bruninga: I would like to have my same objection go to Exhibits 49 and 50 as to the previous Exhibit 48.

The Master: Same ruling.

(Short recess taken while witness makes sketch.)

As to the numerals on Exhibit 51 which I have applied to the various parts of this piston, I indicates the top head of the piston, 2 the lower skirt, 3 the piston pin bosses, and 4 the slot running around the piston. The slot cuts the skirt loose from the head and extends into the ribs, into the edge of the ribs 6, of the piston ribs 6. 5 indicates the angular slot cut up through the skirt to the slot 4, the slot 5 extending all the way through the skirt wall. It extends from the lower edge of the skirt 2 up and into slot 4, connecting with slot 4.

As to the relative dimensions between the head and the skirt of the piston that I am testifying about, to the best of my recollection the head was about, say, approximately, the head where the rings go in, was approximately 005 smaller than the skirt. The piston was fitted in the engine cylinder with a very close fit, just as close as they could be comfortably put in by hand. A man by the name of Johnson machined those pistons at the Amplex Motor Car Company, Mishawaka, in either

the latter part of July or 1st of August, 1914. After the pistons were machined, they were put in a six-sylinder Buda motor, in a car, at the Amplex Motor Car Company, Mishawaka. The car was an Amplex car which belonged to me. The Buda motor in which these pistons were placed had six sylinders, and it was water-cooled. A man by the name of Hoodley put these pistons into the car. I don't remember his nickname. As to his general our. I don't remember his nickname. As to his general appearance, I believe he was sort of a dark complexioned

man about my size, as near as I can remember.

I showed these pistons at the Ampler Company to Houdley; a man by the name of Duck saw them, Johnson, a man by the name of Ort, I believe it was, and I presume others there; I can't name them all. Mr. Bandall was with the company at the same time that I was. II can't say for certain whether or not be saw them, but I am quite sure he did. He saw the castings and he might have seen the finished job.

I believe the proprietor of the foundry across the treet from the Auplian plant from which we obtained the astings, was named Bookhoff, I believe that is the man dealt with. I don't recall anyone close at the foundry at hat time, I wasn't acquainted with any of those operators over there, particularly.

There were seven centurys made in the first place. I

even castings made in the first place. I place" because the first run of castings of full of blow holes and they were bad. e in case one did go had in machining ade over and after one or two runs we as except for the ar.

installed the pistone with as illustrated in the car. I took it out t continuously from the time the pis-nich I believe was in the letter part of said deave it from them until around eventher. I had driven the car, pre-July or in August and draw it from them until around about the list of November. I had driven the car, previous to the installation of these pistons, several hundred miles. Prior to the time that I installed these materials. miles. Prior to the time that I installed these piatons il-lustrated in Plaintiffs Enhibit 51, the piatons in the car were about of the same construction as the Excelsion, practically so, as the Excelsion piaton. They were not split skirt pistons. They were gray iron pistons.

Q. Did you observe the parformance of the car after the pistons such as illustrated in Plaintiffs' Exhibit 51 were installed in it? A. Yes.

Q. What did you notice? A. Well, it was much smoother and there was less roughness in the motor.

Q. Could you tell the difference between the operation of the motor when it had the iron pistons in and when it had the aluminum pistons? A. Yes.

Q. Was that difficult to detect or readily detectable?

A. No. it would be very easy.

Q. You have stated you drove the oar continuously for some period of time. Do you recall how long it was that you drove the car with these pistons in it? A. I drove it from the time they were installed to about the 1st of November, just prior to the 1st of November. I then had the pistons taken out. I went east two weaks, about the middle of October I went to Syracuse, New York and I instructed the boy to take the pistons out while I was gone, and to install the original pistons. And I came back the 1st of November and the change had been made, but the reason for that change was I had a chance to sell the car and get my money out of it, and I couldn't let it go with experimental pistons in it.

(Narrative continued) I know of my own knowledge that that change was made, because I could tell when I took the car out of the garage after the change was made. I was boarding at the Mishawaka Hotel, and the car was brought down and left in that garage next to the hotel. brought down and left in that garage next to the hotel. I came in at 4:00 o'clock on the 4th of November, and took the oar out of the garage. I could tell immediately the original from pistons were in by its action and by the feel of it. I place that date by the fact that that was the date the receivership was closed, the receivership of the Amplex Motor Ouspany by the bondholders of which Kam was one of the principal bondholders, taking it from Palaifer and trustee and myself, who had purchased it from M. W. Mirrans receiver of the Amplex Ouspany in the early part of 1914.

If didn't always own this car in which these pistons were installed. The Amplex Ouspany owned it prior to me, and I sequired the car directly from the Amplex Ouspany in July, I believe it was, the latter part of July, either the latter part of July or August of 1914.

The circumstances regarding the purphase of this

The circumstances regarding the purphase of this car from the Amplex Company, were, that I had loaned the Amplex/Company about \$900 and I took the car in payment, for which I received a bill of sale for the our, which bill of sale I can produce. This is the bill of sale.

(Bill of sale, Plaintiffs' Exhibit 28, produced.)

I believe that bill of sale was handed to me by Mr. Randall's assistant. I know I got it from the office. I then asked him to make a notation as to the number of miles that was on the car when I took it over, because it was equipped with the new pistons, as the date that this bill of sale was delivered to me, and this notation was made on there, either by Randall or by his assistant, merely a notation of the mileage when the pistons were installed in the motor. That notation was undoubtedly made on there the same date the bill of sale was made, at least the day I received the bill of sale. I have already stated that I received the bill of sale the latter part of July or early part of August, but this bill of sale is made on July 16th. If it was made on the 16th, I probably received it on that date. It was on or about that time, anyway. As to the notations on the back of this bill of sale, the notation on the top is to Ralph Jernegan, an attorney in Mishawaka. It says,

"This mileage 6112 when car was left in garage and was not driven but little after until Cook re-

ceived it. (Signed) E. J. Gulick."

I will read into the record the writing on the front of the bill of sale that I have referred to as being placed there at my request on or about the date on which I received this bill of sale:

"Miles on speedometer 816. New type pistons in motor."

The statement, "New type pistons" refers to the aluminum pistons, of a split skirt character, illustrated in Plaintiffs' Exhibit 51. I am referring to the notation on the back of the bill of sale and to the notation in red ink on the front of the bill of sale. Explaining what I mean by that, after my return from the east in November, 1914, the car was turned over to a friend of mine in Elkhart by the name of Atkins. The aluminum pisyons, however, had been taken or removed from the car around about the first of November, 1914. Mr. Atkins sold this car to a man by the name of John Cook for me, and dissipated the proceeds to his own potket, and this notation on here when this bill of sale was turned over to Mr. Jernegan, attorney, was the mileage that was on the car when Mr. Atkins turned it over to John Cook. That covers the notation on the back.

As to how far the car was driven during the period that it had the aluminum pistons in it, I would say that

I placed at least 3000 miles on it.

These aluminum pistons such as we have illustrated in Exhibit 51 were my personal property because I wanted to carry out the experiment, I wanted to install them in my car, and as I had made no assignments of any of the properties, patents on the sleeve valve motor, to the Amplex Motor Car Company, I didn't want anything tangled up until all of the affairs of the institution were in form, and at that time if they had matured, why, then, eas applications were to become assigned to the Amplex Company. So for that reason I kept them separate, purchased the pistons myself and had them ma-chined myself, and they went in as a part of the bill on the car. By purchasing of the pistons I mean that I ordered the pistons from the Rockhoff Company and I paid for the pattern work, the changes which were made in the core box, but the bill for the aluminum pistons was sent to the Amplex Company by Bockhoff and I paid the Ampier Company, for that came out of what they owed me. I paid the Ampier Company for the machining of these pistons. The Ampier Company paid Rockhoff for the contings that were made into these particular pistons that were installed in this car, the pistons being filtu-Company for them. They were paid for in advance because of the fact the Amplex Company owed me much more than my bill for the car and the price of the car. These pistons were mine at the time I bought the car. The pistons were installed in the car about three weeks after I had finished the motor for the oar. With respect to the time when the bill of sale was made out, the in-stallation of the pistons was completed practically the same day that the bill of sale was made out, or the day after. In fact, I know it was after the bill of sale was made out because on this date Randall called my attention to it and the credits were made on the books and the bill was in his office, as I recall, and they were working on my car then, but the car was my property prior to that bill of sale. I regarded the castings as my property when I received them from the Amplex Company. I never regarded those pister castings as the property of the Amplex Company; they never were.

As I previously testified, a sleeve valve engine construction was being worked on at the Amplex Company. This engine was being developed under my supervision. Q. Will you explain to the Court the general features of this engine?

By Mr. Bruninga: Before that question is answered, I would like to make my objection to all this evidence with reference to Exhibit 51 on the same grounds made against 49.

The Master: Same ruling.

By Mr. McCoy: Exhibit 51 is offered in evidence on behalf of the plaintiff at this time as Plaintiffs' Exhibit 51.

By Mr. Bruninga: I want to make my objection

to its offer.

A. The motor was a new design of sleeve valve. The general characteristics of this sleeve valve motor were that it had two half sleeves, sliding, working in between an inner liner and a main sylinder wall.

There were other characteristics of this motor that were new at that time, namely, it was fitted with a new design type of cross head piaton with alit skirt, slot around the top. My ideas were incorporated in that

piston, and no one else's.

I disclosed the piston to Winchester, I believe, some time in April, 1914. The circumstances of that disclosure came about in a general discussion of the new motor and how various details and various features of the motor ought to be built and what was to be incorporated in it. That disclosure took place in a conference, and I also gave Winchester a sketch of the piston of the general form, to give him a general idea. That was the sketch I made in January, 1911. I had the sketch in my possession at that time, but not continuously from January 1st of 1911 until I showed it to Mr. Winchester. It was in the possession of James Offield, along with the original drawing of the sleeve waive motor, for a few months, I don't know just how long.

James Offield was a patent attorney in Chinago. It wasn't carried through by him because of the fact he married one of Wrigley's daughters and took over Wrigley's business and went out of the patent office business, as I understand it. The original drawing of the alcove valve motor, and this algebra I am speaking of, were them returned to me, at which time I showed them to Randall. The about I are referring to in Plaintiffa' Exhibit 36.

The sketch I am referring to in Plaintiffs' Exhibit 36.

The written description, Plaintiffs' Exhibit 37, was never entirely completed. There have been no changes

in the sketches or written material since I first prepared them in January, 1911. After I prepared the written material, Plaintiffs' Exhibit 37, it was in my possession, and during the time, or after I had written up the explanation as far as it goes on these cheets, I was home there very little in the evening, and I simply neglected to fill it out and carry it on, because, as I explained, my wife was in Florida, didn't get home until the latter part of April, and for that reason it kind of got out of the picture, and I laid it to one side, for that reason I didn't finish it up. Later on I delivered the written material in Plaintiffe Exhibit 37, I believe it was first delivered to Pond. Mr. Offield haid the sketch and the written material, Plaintiffs' Ethibits 36 and 37, in his possession, I imagine, for five or six months. He then returned it to me, it was in my possession until I gave the original sketch to Randall. When it was returned to me from Randall, he didn't have it very long. I turned it over then later to Poud. Mr. Poud is an attorney in the Monachock block in Chicago, the same firm, Pond & Offield.

I believe Mr. Pondegot possession of that sketch in the latter part of I believe that was turned over to Pond in the latter part of 1915; I believe it was the latter part, sometime during the year 1915, I just don't remember the date, I can't remember. The purpose of delivering that sketch and the descriptive matter to Mr. Pond was that I made a deal-first, when I delivered it to Pond, the ides was to ro shead and take out the patent, then I made a deal with the Packard Motor Car Company to sell them some old patents which were originally owned by Amplex Motor Car, which were my patents, I was going to take them over and well them to the Patkard Meter Car Company. If made them a proposition on the sleeve valve motor, the piston, and some other things together with it, and then I turned all that material over to Pend to complete the least of the company. plete the deal, and this remained in Pond's possession, with some other prints and some other things and some

other papers, until the early part of 1916.
This material and other prints, prints of the motor complete, and the whole business, were turned over to the Packard Motor Car Company; and the patents were turned over, not any patenta referring to this but several other patents referring to the earlier Amplex cars. A portion of the papers and so forth were delivered through Pond, to, let me see—to Hibben, Davis & Macauley, who were Packard's representatives, and I think this drawing and print was delivered by me direct to Mr. Tibbetts.

By Mr. Bruninga: Objected to as hearsay.

The Witness: Well, I am positive I delivered this sketch with some other papers to Tibbetts. The descrip-tive matter, Plaintiffs' Exhibit 37, accompanied the sketch, Plaintiffs' Exhibit 36, at the time that I delivered these papers to Mr. Tibbetts of the Packard Motor Com-

The names of the attorneys in Chicago, who reprecented Packard Company in this matter, were Bector,

Hibben, Davis & Macauley. e made up at the Amplex plant, under owing that sleeve valve motor with my Drawings were m piston ambadied in that design. I would recognize those drawings and also blueprints of the

(Witness shown a series of blueprints, marked for identification Plaintiffs' Exhibit 20.)

Referring to these bineprints, All represents the inner elegres of the E.J.G. me tor; they were made 7-3-14. The construction of this motor was started in April, about the let of April, 1914, and the detail draw-ings were carried on down through, of all the parts, until the final consistion. The initials on here on this trucing

man" dated 10-8-14; that er words, it is the oe; in oth these drawin the lay-outs. Ar young man by the name of R at't remember his name. I saw the drawings being

made.

(Witness handed a blueprint marked Plaintiffs' Exhibit 31.)

This print is a sectional view through one of the optinders and which shows the general construction of the motor and also shows the form of piston which entered into this design, and which was of the split skirt type. This particular blusprint came from the Amplex Motor Car Company. I know that because it was made in the drafting room of the Amplex Motor Car Company and was the first print that was taken of it or any of the tracings. I received as my personal property the first print that was taken off of every tracing. I recognise this particular blusprint as the first print that was taken from those tracings because it was never out of my possession until it was turned over to the Packard Motor Car Company. I know this because there never was a duplicate set of prints made. There is nothing on this particular print that causes me to recognize it except that it is a very slif print and I am positive that nobody else over had any besides myself. I don't know what happened to the original tenoing from which that print was made. I presume they were in the possession of the receiver of the Amplex Company is November, 1914. I don't know who applied the circle with the capital letter A' in it to that print, I don't remember that.

(Witness shown a blusprint marked for identification as Plaintiffs' Exhibit 32.)

I recognize this binegrint. This is a print of the piston of the E. J. G. motor and as shown in Exhibit A'. This print was obtained from the Amplex Company, Mishawka, in 1914. There was two of these prints made and this particular print was used in connection with the other in premoting the company, in other words, in attempting to raise money to take over the Amplex plant. I don't know what became of the other one, but this one in particular is one I retained and it was in my possession until it was cent to the different places, one of the particular places particularly. I recognize this print as the particular print to which I referred, because it was always in my possession, and the explanation of how the piston operates is in my handwriting in the right-hand lower corner of the print. That descriptive matter was placed on the print right following that time at which I received it in July, 1914. After I received that particular print, Plaintiffs' Exhibit 32, Mr. Pulsifer had it, showed it to some of his prospects. Mr. Atkins had it and it was handled around considerably before it finally came to me.

The print finally came back to me shortly after the receivership. I received it from Mr. Pulsifer. It remained in my possession them until it was sent to the Buda Company, which was, I think, in the latter part of 1915, after July, sometime after July or August, 1915. I next saw that particular print, Exhibit 32, when it was returned to me from the Buda Company, either just before 1916 or just after the first of the year 1916. I know that because it was necessary for me to write to them two or three times in order to get it back. I don't know just when it came back, but they returned it to me, the Buda Company stamp is on this print and it will show when it was received by them, I can't remember the date, but it is on here. (Examining same) August 20, 1915, is the date when the Buda Company received this.

By Mr. Bruninga: I object to that as a con-

The Witness: These Buda Company stamps were on the back of the print to which I have referred, when I received it back from the Buda Company. I believe this print was in Mr. Pend's possession for a very abort time before it was returned to me, and I delivered it to Milton Tibbetta. Milton Tibbetts was connected with the Packard Motor Car Company. That was in the early part of 1916. These prints were delivered to Milton Tibbetts at his office. I went to Detroit for a conference in connection with these prints, and these patents that I was to turn over to them. While I was there I left these two prints of the piston, the one made in 1911 and this one under date of 6.34-14, with Mr. Tibbetts. Inhelieve that was in Martin or thereabeuts. There was a proposition made at that time or just prior to that time, to take over a number of the old patents, and these were to be included, if the deal could be put through by them, I mean if all of the other old patents could be secured. This proposition was made, I think by Mr. Tibbette—proposition made first by me, and then it was more or less mutilated until we finally same to an agreement as to what it was to be. It couldn't deliver all the patents that they wanted, so there was a change made in the price of the original offer.

(Witness handed Plaintiffs' Exhibit 52, com-

These are a copy of a letter from Packard Motor Car Company by Tibbetts, which refers to the patent which I was to turn over to them, the old patent, rather, and including the slide valve motor, with the piston, and also another motor, double-acting, air-cooled, and so forth. I received the original of this letter. I do not know where that original is now. I have looked for it.

Mr. McCoy: Plaintiffs' Exhibit 52 is offered in evidence, a letter from Packard Motor Car Company, by its patent counsel, addressed to Mr. E. J. Gulisk; dated March 27, 1916, dictated as of March 25, 1916.

The Witness: After examining this letter, Exhibit 52, I find that paragraph 1 refers to the sleeve valve motor, the E.J.G. motor. I don't just remember what those exhibits were; they must be the ones you have there. The letter relates to a number of the old patents which the Packard Company were to purchase, also the slide valve motor patent and the piston patent, and double acting air-cooled motor, also to special drawing of a drag link for steering gear; it refers also to the price to be paid for the assignment of these various items.

I can identify the blueprints marked A1, A2 and A3 from the records before me. A1 is a sectional view, Exhibit 31, of the sleeve valve motor; A2 is a right side view of the EJG, sleeve valve motor; and A3 would represent the left side, although the print is made from the

wrong side of the tracing.

Under paragraph marked with the numeral 2, I have referred to a motor piston illustrated and described by a pencil drawing marked B1 and a two-page description marked B2, and I can identify those particular papers as Exhibits 36 and 37 here before me. The letter also refers to a bineprint marked B3, which is the bineprint of the piston in the E J. G. motor. The particular bineprint referred to in this letter before me, is Plaintiffs Exhibit 32. These are the same bineprints that are referred to throughout this letter and identified by me as bineprints marked A1, A2, A3 and B3.

(Witness handed several sheats of correspondence marked Plaintiffs' Exhibits 53, 54, 55 and 56.)

This is correspondence with the Packard Motor Car Company relative to the patent transaction, sales. I do not know where the original is of Plaintiffs' Exhibit 55. I received the original letter. I searched for the original letter but did not find it.

By Mr. McCoy: I offer in evidence Gulick Exhibit 53, which is a letter addressed to the Packard Motor Car Company and signed by E. J. Gulick, dated April 1, 1916; Plaintiffs' Exhibit 54, a letter from E. J. Gulick addressed to the Packard Motor Car Company, dated December 4, 1916; an original earbon of a letter from patent counsel, Packard Motor Car Company, addressed to E. J. Gulick. dated February 28, 1917, as Plaintiffs' Exhibit 55: and a letter addressed to Mr. Milton S. Tibbetts, counsel, care of Packard Motor Car Company, from E. J. Gulick, dated May 18, 1917, Plaintiffs' Exhibit 56.

(Thereupon, at 5 P. M., on Saturday afternoon, Mr. Richey stated as follows:)

By Mr. Richey: It has been suggested, I believe everybody including the witness agrees, it is wise to adjourn now to March 14th and bring him back,

or whenever the next session is to begin, to bring him back and complete his testimony then.

By Mr. Brumings: I would like to make one statement before we go. Counsel has persistently refused to state their position with reference to these Guliek Exhibits 48, 49 and 51. I believe in that case it is not too much for me to ask that before I be required to put Mr. Schoengarth on with regard to that piston which I referred to, that coun-sel should state their position with reference to whether that is in the scope of the Gulick patent. There has been a possilar situation established, that, in the first place CCC, I can't see where that distinguishes from the Schoengarth, and in the second place, if these particular Exhibits 48, 49 and 51 are within the Gulick patent, then Schoengarth is very pertinent; if they are not within the scope of the patent, and this thing develops on a flexible rib, it might be useless to call Mr. Schoengarth.

By Mr. Richey: We will state our position at the proper time. We have no desire to argue the

case at this time.

The Master: The suggestion will be noted at this time and your request, and you can state your position at the further hearing, as to these exhibits referred to.

Thereupon, adjournment was taken to March 14, 1933.)

(Thereupon at 2:00 o'clock P. M., Tuesday, March 14, 1933, the hearing was resumed.)

C. McCoy, for plaintiffs; and John H. Bruninga, Esq., for defendants.)

By Mr. Richey: I have a statement to make about those claims.

Pursuant to an agreement made by counsel at pages 193 to 195, inclusive, of the record, counsel for the plaintiffs announce that they charge that the piston Exhibit 3-J infringes the following claims of the Gulick patent: 1, 4, 15, 25, 28, 33, 36, 42, and 43.

Is counsel for defendants willing that the piston Exhibit 3-O should be included in the case under the same stipulation as CCC and 3-J, occurring at pages 193 and 195 of the record, and the same agreements as are set forth at pages 193 and 195 of the record?

By Mr. Bruninga: Yee; but I want to look into the record to see whether it will be perhaps necessary to put in some testimony with reference to this exhibit.

The Master: I think counsel is entitled to have the chance to examine with reference to that.

(Thereupon discussion had as to whether defendants had rested, and matter held in abeyance.)

EDWARD J. GULICK thereupon resumed the stand for further direct examination.

DERECT EXAMINATION by Mr. McCoy.

(Witness handed letter dated March 26, 1917 from 161 J. Guliek to Packard Motor Car Company, Mr. Pibbetts, connect.)

This letter refers to a number of early patents that I was taking over from the receiver of the Amplex Company (6) be transferred to the Packard Motor Car Company. This letter relates to the same general transaction between myself and the Packard Motor Car Company that is dealt with in the letters, Plaintiffs' Exhibits 52, 53, 54, 55 and 56, inclusive, heretofore identified by me. This letter is a reference to all the correspondence and all the patents in guestion.

The statements of fact made in these letters, Plaintiffs' Exhibits 52 to 57, inclusive, are true and correct.

By Mr. McCoy: The letter identified by the witness, Plaintiffs' Exhibit 57, is introduced in evidence.

During the time that I was connected with the Excelsion & Manufacturing Company in 1911, that company sequired some of their piston castings in Chicago and some in Cleveland, and some of them were made by the Manufacturers Foundry Company of, Il believe, Bridgeport, or Bast somewhere in that meighborhood.

The Bresheit Motor & Manufacturing Company had core-boxes and patterns for the manufacture of those entings. The patterns were the standard piston box patterns or piston body patterns, and the core-boxes standard piston core boxes of motal, the same general type. I recognize the core-box: 58 as the standard Bresheit piston pattern. These were the character of core boxes unit patterns used to precise pistons like Plaintiffs' Exhibit 47 at the time that I was commented with the Excelsion Motor Company.

Mr. McCoy: The core-box and pattern identified by the witness Plaintiff's Exhibits 58 and 50, are each offered in evidence.

The Witness: The automobiles in which the split abirt pickers were installed maker my expervision and direction width. I was connected with the Excelsion Motor & Massellactering Geopeny in 1911, were experimental care built by the Excelsion Comments; two of them only were ever built; they were of the Benealt type. By that I mean that the relation were of the Benealt type, it the rear of the rester. All other parts of the converse standard parts pithed up from different concerns. The motor was the standard Excelsion motor was the standard Excelsion motor from a standard Excelsion motor there were also a number of miner thanges for different motors. Such as matter thanges for different meants are such as the matter. Such motors were commently called by the meantfacturer's means, although they were standard Excelsion.

The particular automobile in which the engine having the uplit skirt picton was placed under supervision and direction in 1911, was one of these two cars of the Renault type. By Mr. McCoy: Opposing counsel admit that the original of the photograph which will now be submitted to the witness for examination is lost and that the letter dated December 1, 1927 from Webb & Bocoreelski-Norris Peters to The Gates Legal Publishing Company of Cleveland, Ohio, explains the loss of this photograph.

(Witness handed a picture of a car.) (Exhibit 60.)

The photo Exhibit 60 is of the same car in which the split skirt pistons were installed by me in 1911. The original of that photograph was made by, I believe, the original was taken by a man by the name of Williamson

original was taken by a man by the name of Williamson — Williamson and his wife, my wife and myself, made a trip to Mishawaka about the lat of October, 1911. This photograph was taken sensenber man Mishigan City, either on the return trip or the trip going down; I don't remember which.

I remember what character of pistons were used in that car at the time the photograph was taken. They were standard Excelsion pistons, split seroes the top and cut down the skirt. That is, pistons of the character of Plaintiffs' Exhibit 48, concerning which I have previously testified. As to the manner in which those pistons were litted to the manner in which those pistons were litted to the manner in which those previously testified. As to the manner in which more pistons were fitted to the motor of that ear, the skirt was a very desself. The head pertice, however, was ground to a standard described described alightly mercias of the standard grind. By "standard described for the head pertice," mean that Excelsion pistons were given the deschard electrons of short seven the manuality of an inch throughout the length of the head and down and including the bottom ring including the The second secon ed in any form from the standard form of the Brpleton, but the skirt was increased in dismoster to
it a very close fit to the hore. The head pertion of
ston. Dishibit 48, is the portion that carries the ring
to the slot, down to the skirt.

Ith recent to the skirt.

With respect to Exhibit 48, the relief of the head portion extended to the slot, everlapping the slot. With respect to the entire dreumference of the pictos, the relief extended completely around the picton.

With respect to the fitting of the wrist pin in those pictons, they were a very close fit; about as close as they

could be made; and driven in lightly; but in these particular pistons they were held in with one set screw in them, the object of the set screw being merely to prevent the pin from moving endwise in the piston. The set screw was located in one of the bosses.

The pistons that were installed in the motor that was placed on the test block and tested out on the test block at the Excelsior Motor Company were fitted in the cylinders the same as in the test motor, the same as in

the motor in the test car.

The general conditions of fitting the wrist pins in the pistons that were installed in the motor that was given a block test at the Excelsior Company, were the same as in the Excelsior motor. There were two styles, however, of connecting rods used in the Excelsior motor: one with the clamp rod on the piston pin, and one with the rothing rod on the piston pin. I don't recall which one of those rods were in the Excelsior Motor that was tested. Were it the rocking rod, there would be no set screw in the piston. If it were the swinging rod, why, there would be one set screw in the piston.

The two-cylinder motor to which I referred was a two-cylinder-V, four cycle motor. Those motors were first used by the pelice department of Chicago, and also for rading purposes at the Motordrome. They were

motorcycle motors.

My prior testimony regarding the last few questions has referred to the tests made on the motorcycle motor and not the tests made on the block on the motor that was not later assembled in an automobile chassis.

The pistons in the Excelsior motor that was tested on the block and not later assembled in an automobile, were equipped with wrist pins the same as they were in

the motor in the automobile.

Again referring to the pistons, the split shirt pistons that were tested in the motorcycle engine, with particular reference to the fitting of the pistons with respect to the cylinder wall, the head clearance on the morcycle piston was not changed; the shirt, however, was enlarged. The clearance of the head would be substantially a standard clearance whereas the skirt clearance would be very small relative to the cylinder wall.

With respect to the use of the split skirt piston in the Renault type of car, the motorcycle pistons were tested in the early part of the summer of 1911, prior to the opening of the Chicago Motordrome, which I believe

was in about July, about the 4th of July, somewhere thereabouts.

Q. Did you examine the split skirt pistons taken from the Renault car after their removal from the engine? A. Yes.

Q. When was this? A. It was just prior to the sale of the Excelsior Motor Company in Nevember, 1911.

Q. What did you find with respect to the condition of these pistons? A. Found nothing wrong with them; they weren't scored, and were in perfect working condition.

Q. Why did you remove those pistons from the car at that time? A. We had orders from the creditors' committee to dispose of both cars and all Excelsior motors. These cars couldn't be sold with experimental pistons in them; for that reason they were removed and standard pistons replaced and the cars sold.

Q. Were all these pistons in that condition when you removed them finally at the time of the receivership, in

19117 A. Yes.

Q. Were any of the pistons taken from that Renault type of car broken in any way at the time the pistons were removed? A. No.

Q. Did you examine those pistons at any time prior to their final removal from the Renault car? A. Yes.

Q. What was the occasion for that? A. One of the pistons was broken; defective one removed and a new one installed.

Q. What was the condition of the remaining pistons at that time? A. Perfect.

(Narrative continued) After the pistons were taken from the Benault car, after their final removal, they were scrapped. The pistons taken from the automobile motor which was subjected to block tests were also scrapped after their removal from the motor. The pistons from the motorcycle engine were scrapped after they were removed.

At the time of removal of the motorcycle pistons one of them was perfect, and one was bursted at the pin hole.

By Mr. McCoy: The photograph identified by the witness as a picture of the Renault type of car driven by him in 1911 is introduced in evidence as Plaintiffs' Exhibit 60. And the letter accounting for the loss of the original of the photograph, is introduced in evidence as Plaintiffs' Exhibit 61.

The Witness: Again referring to the sketch and descriptive matter, Plaintiffs' Exhibits 36 and 37, these were kept together by me at the time they were in my possession. These sketches were made on a very inferior grade of bond paper. This paper came from the Amplex Motor Car Company, Mishawaka. When I left there in 1910 I took some of that with me to Chicago; it was used only for sketching purposes.

At the time th is sketch and descriptive matter of Plaintiffs' Exhibits 36 and 37 were made, I showed it to my wife in order to give her an idea of what it was all about, so that'in case anything should happen to me, she would be able to pretect herealf, perhaps make some use of it. She was something of an automobile driver and understood fairly well the meaning of such things. As there were only two of us, our interests were mutual. A great deal of my work in this respect and in other respects was done at home, and she was familiar with prectically all of the sketches and drawings which I made I explained completely to her at that time the structure of the pisten shown and described in Exhibits 36 and 37. She indicated that she understood it. I explained to her at that time the operation of the piston shown in Exhibits 36 and 37, and she indicated that she understood its operation. I believed that she understood its ture and operation of the piston because in her conversations she seemed to understand thoroughly what I was talking about.

By Mr. Brunings: May I interpose a question at this point? So the master will be familiar with the situation? Mrs. Galick is dead. I therefore interpose an objection.

By Mr. Bichay: I think it is competent to show a disclosure.

By Mr. Brunings: It is not at all competent in this case. The city purpose could be to have somebody correborate him, and the correborating party is dead. And I object particularly as to what she might have understood.

By Mr. McCoy: I think it has already been brought out that Mrs. Gulick is dead. We are offer-ing this evidence to show a disclosure of the subject-matter of this investion to Mr. Gulick's wife at the time these sketches were made.

The Master: I think I will overrule your ob-

jection and you may have your exception.

(Short recess taken.)

The Witness: I recall showing this sketch and descriptive matter to a man by the name of Grubb, Frederick Grubb, at the time these papers were prepared in 1911. He is now dead.

> By Mr. Bruninga: Same objection. The Master: Same ruling.

(Narrative continued) As to the relation between Mr. Offield and Mr. Pend, the patent lawyers in Chicago to whom I turned over Plaintiffs' Exhibits 86 and 37. these papers were turned over to Mr. James Offield, Jr. in the latter part of 1911 or around about the first of 1912. Mr. Offield was connected with the Offield, Toll, Graves & Offield Company. Later on he separated from the old company and went by himself. After a number of months I was unable to get any satisfactory answer from him as to what was being done, and later I ordered. the papers turned over to Pond. Pond at that time was connected with Officid, Toll, Graves & Officid. Some time later, Pond's connections were severed with Officid, time later, Pand's connections were severed with Offield, Toll, Graves & Offield, and it became the firm of Pond & Wilson. These papers were then in Pond's possession and were in his possession until the latter part of 1913, or about the first of 1914, when they were turned back to me for the purpose of designing the EJG motor in 1814. Some time later in 1914, the latter part or the early part of 15, they were again returned to Pond, and were in his possession up to or just prior to the time of the sale of the various other patents to the Packard Motor Car Company. Pond returned them to me and I delivered them to the Packard Motor Car Company. Pond returned them to me and I delivered them to the Packard Motor Car Company is the early part of 1916.

Q. Now, referring to the split skirt aluminum pistons that you have heretofore testified were installed in a Buda motor at the amplex Company in 1914, did you examine these pistons after they were placed in that

examine these pistons after they were placed in that motor at any time? A. No, not until they were finally

taken out. Q. What did you find to be the condition of those pistons at the time they were removed? A. The pistons were in perfect condition, with the exception of the piston pin bosses, which were not pounded out, but they were freer than they should have been where the piston pin fits into the bosses.

Q. Where were the pistons at the time you examined them! A. In the erecting room of the Ampier Motor

Can Company.

By Mr. McCoy: The various exhibits heretofore identified by this witness are offered in evidence on behalf of plaintiffs under the numbers by which they were identified. I think several of those have been offered in evidence. In the event I have missed any, I am now offering them in evidence.

By Mr. Bruninga: Any objection to those offered in evidence and identified I would like to

have stand as against the offer.

The Master: They may be received, with the same reservation.

By Mr. McCoy: Direct examination closed.

Choss Examination by Mr. Bruninga.

I had three sets of pistons made, corresponding generally to Exhibit 48, which I tested about May, 1911. The first test was the motor block test on the motorcycle piston. The motorcycle pistons were never tested in a motorcycle; it was tested on the block, on the motorcycle block. The first set was a small motorcycle piston about 2-9/16" in diameter. That is the diameter of Exhibit 49. That was slit in the same way as Exhibit 48. Both the circumferential slot and the inclined slot were about the same. That motorcycle piston had these ribs on the inside extending circumferentially from the wrist pin bosses as in Exhibit 49, and the inclined slot was in the region between the wrist pin bosses. That inclined slot did not necessarily cross any of the circumferential ribs going from the wrist pin bosses.

I found that piston with the circumferentially extending ribs from the wrist pin bosses to be fairly flexible, I don't think the circumferential ribs had effect enough on the flexibility to interfere with it. I actually found that to be a fact. The fact that the pistons refused to seize, and that you could close them with your hands a couple of thousandths, was proof enough to determine

that fact.

Taking a piston like Exhibit 49, with a slot circumferentially around the piston, and just below the ring land, and with a diagonal slot, you can't close the slot up the full width of the slot, but you can close it a thousandth or better. You can close the whole thing so it won't seize. I actually did that with my hands. You can take a construction like Exhibit 48 and close it with your hands enough so that it won't seize. There is a

long free end at the top in Exhibit 48 which helps the structure in closing sufficiently to prevent its freezing. It wouldn't be necessary to close the short part or move that very much. That is why he slit the cut diagonally, to allow the two overlapping points to close one over the other. I could very readily close the slot at the bottom. That would not be true irrespective of whether I had the circumferential slot. You have to have the circumferential slot around here in order to make this portion close in. The bottom would close about as well if you simply

had the inclined slot, but the top would not.

The head of the piston was relieved the standard clearance. The standard clearance was given to the head down over the rings and onto the slot, overlapping the slot, all the way around, whatever your wheel would grind, down to that; that is what the clearance would be. I can't say as to whether the piston, Exhibit 48, was made that way or not. That piston when those slots were cut, wasn't ground to anything standard, not that I know of. I ground the one I had the standard clearance from the head down to the slot, and the skirt was ground over the standard size, but no change in the head. I never relieved the region of the skirt or wrist pin bosses on either side; not any different than that you see there; that is the standard make-up.

Going back to the first standard motorcycle piston, that was made in the neighborhood of May 1911. It was before the Motordrome opened in July. That was the cast iron piston. I gave that a thorough trial. I can't say how many hours, total hours, that piston was tested on the block, but I know it was on the block from one afternoon until the next night; the motors were run all

night.

I don't remember what the clearance of the skirt was. It was larger than the standard skirt. It was a very close fit; it was larger than the standard fit; just as close as could be gotten in the cylinders and pushed through with the hand and not fall through. It was a very close clearance; but the head clearance was just the standard clearance. I ran the motorcycle engine with wide-open throttle, and on the dynamometer. It was a good hard test for the piston as light as it was constructed.

Q. You were thoroughly satisfied with it? A. Thoroughly satisfied. If the construction of the piston had been developed for that particular work, that was a

chance to find out what would happen, whether the piston would seize or whether it would not. That was the principal object of that test; it wasn't to put that particular piston into practical use, because it wasn't designed for that particular purpose; but to find out the result of the slot, whether it would seize or not.

Q. But the test was sufficient to satisfy you as to the practicability of that method of slotting? A. Abso-

lutely.

Later I started to have a set of cast iron pistons made for that Renault car. That was around July of the year 1911. I took the standard Excelsior piston casting and slotted it in the method that is illustrated by Exhibit 48, but it was not ground the same as the standard. It was slotted the same as 48; the grinding was not the standard grinding. The head was standard grinding. The skirt was over-sized. That skirt had a good snug fit, very much closer than the ordinary cast iron fitting which I used before that date.

That piston didn't have any relief in the region of the wrist pin bosses, up and down; I didn't need it.

Q. That was, again, a cast iron piston? A. Standard Excelsior cast iron piston.

Q. Now, how many were in that car, four or six? A.

You are referring to this photograph?

Q. The Renault carf A. Four. What do you mean cylinders, people, or what?

Q. No, how many cylinders! A. Four.

Q. Now, you operated that car for some time, did you! A. Yes.

I ran the car practically all the time myself. I made it my own use; it was a factory car. I used the car to drive back and forth from my residence to the factory, and Sundays and Saturday evenings for pleasure and whatever else I wanted to use it for. I was factory manager for the company at that time. I didn't use the car very much to haul anything other than human beings. We might have hauled a load in it once in a while, you can't tell. I used it regularly in business, and for pleasure purposes, too. I used it, the same as if it was my own car. It was also used the same as if it was a company car. The car belonged to the company. I found the pistons worked to perfect satisfaction.

Q. How long before you found out it worked to perfect satisfaction? A. Well, the car was driven the first time in July and it was about October when I was on the trip to Mishawaka, the first trouble came up with one of the pistons. That was the first indication of any trouble.

Q. Do you know what caused that troublet A. I.

don't know what caused it.

Q. Well, that happens in pistons, even standard

pistons, isn't that right! A. Yes.

Q. But you were perfectly well satisfied even before you made the Excelsion pistons for the Renault car that the previous test of the motorcycle piston was satisfactory, isn't that right? A. I knew they were satisfactory.

Q. You then drove that Renault car 3,000 miles? A. I wouldn't say whether it was 3,000 or 4,000 or 2,500; it was driven a lot of miles, I don't remember just how

many.

Q. But at least a month? A. It was driven longer than a month. It was driven from July to just prior to the 1st of November.

Q. And used just the same as any other car! A.

The same as any other car.

Q. And you hadn't looked the pistons over in a week or so to see how they worked? A. No, because there was no trouble with the pistons until about the 1st of October, that is when one went bad. They were all taken out then. There was no indication of scoring on any of them; they were all perfect with the exception of the one that had a fracture in the boss.

Q. That was simply a mechanical defect due to the casting? A. That was broke, all there was to it; that was replaced. There was no more trouble until removed

from the car.

Q. You say about the 1st of October? A. About

the 1st of October, as near as I can recollect.

Q. The car had been run from July, August, September? A. Yes.

Q. You run it from October until-7 A. Until the

latter part of November.

Q. And you then took the pistons and threw them

away! A. They were scrapped.

Q. Who scrapped them? A. I don't know who put them into scrap. I saw them. I examined the pistons when they were taken out of the car. They were taken, and in our test room we always had scrap, a lot of things that were throwed in the scrap pile, and there they were left.

Q. You saw them being thrown there? A. I looked them over before they were put there, and saw them

thrown there, that is all there was to it.

Q. Now, coming next to that piston that you used in the Amplex Buda motor car, of which you have the sketch Exhibit 51. Do you consider there is much difference between Exhibit 51 and Exhibit 48, so far as principle of operation is concerned? A. Yes, some difference.

What is the principal difference?

By Mr. Richey: I object to this testimony asking the witness for his conclusion. He has been put on as a fact witness. He can ask him how the pistons operated.

The Master: Oh, I think he may answer. You

may have your exception.

By Mr. Richey: I point out he makes the witness his own when he is asking for his opinion.

The Master: He may answer and you may have

your exception.

The Witness: The difference between 51 and 48 is that the slot in \$1 extends completely around below the head, and that 51 has double ribs extending from the head to the piston pin bosses. The fact this slot, which is cut completely around, affords a degree of greater flexibility than could be obtained in 48. Also if 51 were made up of aluminum, more strength would necessarily be required than there would be in the design of 48. The flexibility of the piston, Exhibit 51, is affected by the fact that the slot around the piston also runs past those ribs. It is more flexible in every direction. should be shown in the top middle figure; it should have been dotted across there. The slot is shown here in course, passing by, going through, at 6-6. That slot shows here (indicating), but I omitted to put it in there. That is merely an error in the sketch. Both pistons, Exhibits 51 and 48, embody the feature of having the circumferential slot and having the vertical slot. I consider Exhibit 51 a further development of the principle of Exhibit 48. I actually tried that Exhibit 51 piston out in the Amplex car. I did not give it a previous block test. We didn't have any block test.

Q. You were perfectly satisfied from the performance of the motorcycle piston and the piston like Exhibit 48, the Renault piston, it would work? A. I was per-

fectly satisfied with the result.

Q. So you just put it right in the car and drove it around 4500 miles? A. Yes.

Q. And it never even occurred to you to look at the pistons to see whether they scored before you took them out? A. Never had any trouble with them at all, and they never did score.

(Narrative continued) That car was used pretty hard. It was driven a lot of miles. I don't remember how many, but it was driven every day and every Saturday and every Sunday over the week-end, sometimes three or four hundred miles over the week-ends, and it was driven at all speeds as fast as it could be; lots of times full power of the motor. It never was favored in any form. That is why they were put in, to find out what they would do.

Q. And you were perfectly satisfied right from the start? A. Right from the start they never gave a particle or a sign of trouble.

(Narrative continued) I ran the car with those pistons in it up to the 12th or the 11th of November. No, it was taken out prior to the 11th of November. 11th of November I saw them. No, they were driven from July until about the middle of November, or a little later, when I went east, and I instructed the force to take the pistons out of the motor and put back in the Buda pistons, as I had a sale for the car. I came back on the 11th of November, and when I came back the car was in the garage down by the Mishawaka Hotel waiting for me. I drove it to the factory. That was the day of the receivership, 4:00 o'clock in the afternoon; 4:00 o'clock in the afternoon when I arrived there, to be exact, and the sale was over, the factory was gone. And we had some castings for this E. J. G. motor, they had come in while I was away, and the new receiver and the bondholders practically gave me to understand if we could straighten the matter out he was willing to assign them back to us. So he didn't prevent me from going back to look in the factory at the new E. J. G. motor, and that is when I had the charge to examine these aluminum pistons; they were in perfect condition, and that is the last time I saw them.

Q. What did you do with them? A. They were set aside, I suppose they went into the scrap when the receiver—

Q. In other words you threw them away? A. I didn't intend to throw them away, but they got away, I

didn't have any chance to get them after that. I never was in the factory after that day.

Q. Why didn't you go in the factory after that day to get your pistons? A. I was out busy trying to raise some money to get that factory back into my possession. We didn't figure we were going to lose it, but we did.

Q. When did you find out the pistons were gone?

A. I didn't find out the pistons were out of the factory until spring.

Q. How long? A. Until the early part of the season, until we finally found out we couldn't raise the money, then I tried to buy back the castings for the E. J. G. Motor, and the whole business, so we could start anew, and I found out the scrap had been sold, everything had been sold.

(Narrative continued) I didn't have any contract whatever with either the Excelsior or the Amplex Company that I would turn over my inventions to the company. The pistons in the Excelsior Company didn't belong to the Excelsior Company, they belonged to me personally because I paid for the work that was done on them, but because I had no right under the receivership, was instructed to do no experimental work on the company's time, I bought these pistons and tested them out to my own satisfaction, because I knew later on I was coming back to Mishawaka. That is why I did that, test out the pistons. I mean Eixhibit 51, that was put in the Amplex car in '14; that was my personal property. Those pistons were paid for long before they ever went into the car. The car was my property four weeks before I received the bill of sale, and the reason I didn't receive it was because the car wasn't complete then, and the bill of sale was made out when the car was not complete, so the net result was I didn't take the bill of sale until the top was put on the car, and when the top was put on the car and the bill of sale was made out that was the day the aluminum pistons were finally installed.

Q. So you went back the following spring, in 1915, to see where the piatons were? A. No, I didn't. I didn't go back to the factory to see where they were. My statement was in the following spring we were unable to raise the money, Kamms then were running the factory, and they refused to let us have the factory, when we had enough money to raise the bond; so I was turned out. I was never in the factory after that, and I was told by the employees that all the pistons and everything per-

taining to the work was acrapped; they were put to one side.

(Narrative continued) I didn't take the pistons out of the car; they were taken out while I was in the east and the original Buda pistons reinstalled so that the car could be sold as a standard motor, with a standard motor in it. There wouldn't anybody want those pistons in, because he wouldn't know but in six months or so he would want to replace one and he wouldn't know how to get it. You wouldn't want to go out and buy a car with a set of experimental pistons, and if you broke one of them you had something you couldn't replace, and you would be up against it. That was the reason they were taken out. I wouldn't sell anything to anybody like that. That was a Buda motor, and if he had one taken out he could put one back.

I did not have the pistons taken out because I was afraid they would break. I didn't want to sell the car with a set of pistons that weren't standard and he couldn't replace. I had a sale for the car and that is why I ordered them out. If I had kept the car myself I

wouldn't have taken them out.

I had the original pistons put back in on account of the sale, and for no other reason whatever. I didn't want to leave the pistons in, because he couldn't replace them, where he would want to get them maybe several months or a year after; where could he get a set made!

Q. He could buy a set of Buda pistons?

The Witness: Yes, he could, but there is no logic in

that, as far as I am concerned.

That is the reason I took them out, so I could give the man his money's worth. I intended to keep the pistons. I didn't want them to get away from me and let them get out in the car, something that wasn't standard, that would be a very foolish thing for a man to do.

I got through with the Amplex Company when they went into the hands of a receiver in November. I never was in their factory after that day. My car was never in the factory after that day. The car was sold shortly after the first of the year, or before the first of the year, shortly after the first of the year the car was sold; I never saw the car after that, and never rode in it; it was sold to a banker in Elkhart.

I used that car from April to November, 1914 for my own business, for company business; it was my own personal car; it was paid for long before I got it. I used it for going on trips, even on short trips around town or company business, or my own business, everywhere. I used it in business; I donated it in business, you might say, I donated it. I used it for business and pleasure. I donated it for business.

The company I am working for today don't pay for my car, and I don't charge them for running it on com-

pany business.

I haven't got that particular Amplex car with those pistons in it. I did use it in 1914, on company business and my own business. I don't know what the mileage was. I don't remember now.

Q. You figured it out from the record, you had the bill of sale, and from the notations on it, that the difference between what the speedometer read when you got it and the speedometer read when you sold it, checking off about 300 miles for good measure, was around 4500. miles. A. If that is the way it figured out, that would be it.

(Narrative continued) As to who saw the first pistons I put in the motorcycle and those split pistons, slotted like Exhibit-48, that is the cast iron piston on the desk, I don't remember the superintendent's name of the motorcycle department, piston department—the name was Lundin, John Lundin.

I don't remember who the fellows were that were running the test. I didn't try to hide it from anybody.

Coming next to the pistons like Exhibit 48 in the Renault car, I imagine quite a lot of people saw them; they couldn't very well help it. I am sure a man by the name of Johnson and a man by the name of Engle saw it. Johnson was foreman of the tool room. Johnson was the man who had instructions to cut the slots. Beard was the man who had instructions from the piston department to do the grinding, grinding them oversize to close fit. Beers was the one who did the grinding in the piston department.

There might have been a lot of the fellows in the shop who saw it because he couldn't very well grind them in the piston department without others seeing them, and they might not have known what they were. 15 or 20 men in the tool room when Johnson was cutting the slot, probably saw the slot and wanted to know what it was. The place wasn't roped off. Lots of the em-

ployees could have seen it, of course.

When it was put in the ear it wasn't kept secret. The man who put it in the car, helped put them in, did this this slot, that wasn't done in the tool room. I mean the vertical slot. This angular slot; that was sawed in; the man that put them in the car sawed that slot in there.

I don't think Harvey Williamson ever saw the piston. I know he didn't see the piston because he couldn't have seen it. I don't know of anybody outside of the company that I can recall the name of, saw it. But there is no question but what employees in the shop saw it because it couldn't have been kept under cover because it was too much open. Very likely whoever collected the scrap saw it and wanted to know what it was all about. He might have I don't know, I didn't see the scrap sold.

When I got the pistons like Exhibit 51 that was used between July and November, 1914, in the Amplex car, aluminum pistons, I don't know that a lot of people saw that piston; but I know a man by the name of Rockhoff saw them. He made the castings in the Rockhoff Foundry. I know a man by the name of Johnson saw them, not the Johnson I spoke of before, but another Johnson of the Amplex Company, tool room foreman, a man by the name of Hoadley saw them. A man by the name of well, I don't know who did see them. There was at least a dozen around there that saw them. Hoadley was the man, as I recall it, that put them in the car. He had a helper; who the helper was I don't know. Just what I say now, I would say probably 10 people, maybe more, saw them. I wouldn't limit that to employees of the Amplex. I don't know who all saw it. There might have been others in the factory, come in at the time, The factory wasn't closed up, but open, and there wasn't much going on, and there might have been other people,. people in the office saw it. Some of the boys in the drafting room saw it, and the boys out in the shop saw it. They had all had a whack at it. There wasn't more than 20 or 25 people, employees, there, all told.

I think a man, outside of the Amplex Company, by the name of Atkins, saw the piston. He was selling stock for us. He might not have seen it but I was under the impression he might of because he drove the car him-

self considerable.

It was all open and above board; anybody could see it that wanted to. We had nothing to put under cover on it.

Q. And you never had the Renault or Amplex car pulled down to take out the pistons except that one you said was broken in the region of the boss! A. That was on the Renault, that was the only one that was taken

(Narrative continued) It was taken down by a man by the name of Engle, an employee of the Excelsior Com-

From the previous motorcycle experience, I was perfectly satisfied that the pistons would work, that the theory was right, the idea was correct, even before those pistons were put in that Excelsior car. That was also true before I put the pistons like Exhibit 51 in the Amplex car.

The Renault car, with the pistons in it like Exhibit 48, was run from July to November, whatever the mileage was, and then they were scrapped.

The pistons like Exhibit 51 were used from July to November, 1914, for a distance of about 4500 miles, and then taken out and eventually were lost.

Apparently the cast iron pistons were sold for scrap; they could not have went anywhere else. I think the alu-

minum pistons were also sold for scrap.

Q. I would like to clear up one point with reference to the aluminum pistons. Did you make a thorough search for them to see if you could find them! A. No, I never saw them, never was in the factory from the 11th day of November, 1914; that is the last time I saw them.

(Narrative continued) Some of the employees in the factory told me they were gone, I don't recall who. I think Randall. I think Randall said that they were there for a few months after the new receiver took it, for a period of time, and when the Kamms took the factory over they sold all the antomobile parts, sold all the scrap, aluminum and everything, wiped it all off the map; they never built another car, never even attempted to, and everything went into the scrap pile, and they realized whatever they could. They intended to run the company, but they didn't; they run for a few months and then sold it to the Jewett people.

I made inquiry about the E.J.G. motor, if they still had the castings there. I wanted to buy them and finish the job. And he said no, it had been scrapped, everything that went with it. I asked them if the pistons were there yet and they said no, everything had been scrapped,

there wasn't anything.

Q. You asked him particularly about the type 51

piston? A. Yes, I did.

Q. The reason why I asked you, is whether you referred to them or to the particular pistons of your application drawings of which you had eastings made.

A. I am talking about 51.

(Narrative continued) I made this inquiry long after, it was in 1915, in the early part of 1915. It was when Kamm turned us down and wouldn't accept our money. I made inquiry of what had become of all of this

stuff that we was carrying through.

These pistons were part of the experimental work; that was why they were put in the Amplex car, that was one of our purposes because in testing a new motor we intended eventually to use aluminum pistons, but we weren't sure of how far aluminum pistons would go in the industry, or nobody else knew, I think you are aware of that, it was an early jump into the game, no one knew how the pistons would work. We knew they wouldn't work solid, if they were fitted close the material was against it, but if it moved out, if they were slotted and split, they would work, and work satisfactorily, and that was proven down there. That was the first set of aluminum pistons I tried out, and they did work. If we ever completed the new motor, the aluminum pistons would have been in the other motor of the other type.

In 1915 I found out everything had been scrapped in relation to that motor, in relation to that test stuff, everything in the factory, I was told; I don't know what the details were. It was the early part of 1915 when we were turned down on the sale, on the taking up of the bonds. That must have been along about May or April, the early part of 1915, or right around in the neighborhood, when they finally turned us down flat, that is when I made inquiry, because we were still figuring on going on and getting hold of these castings and stuff and getting hold of it and taking it to Elkhart and starting a

factory there; but our plans fell through.

The man who informed me of the fact those pistons had been scrapped didn't tell me what junk man got them. I don't suppose he knew any more about it than I did. I didn't ask him about it. I simply made the inquiry, and the answer I got was everything had been scrapped. Everything was gone so that was the end of it, so I didn't look any further. I was not so particularly interested

in getting the pistons back because I had the aluminum pistons already designed to go ahead with it, but I would like to have got them back.

Q. But you made no efforts? A. I couldn't make any efforts. My impression was they went into the

foundry across the road and was melted up.

Q. And you haven't made any pistons of either the motorcycle type or the Renault car type or the Amplex type since that time, have you? A. I slotted one piston of that type since then; about 1926, I would say, just prior to the taking of the original interference. That is the piston right there (indicating Exhibit 48). I was asked to do that for the purpose of that interference proceeding; that is the only one I touched at that time.

(Thereupon, adjournment was taken to the following day at 9:30 A. M.)

(At 9:30 A.M., Wednesday, March 15, 1933, the hearing was resumed.)

FURTHER CROSS EXAMINATION by Mr. Bruninga.

My conception in 1908 was on the order of Exhibit 51, the one with the slot clear around the top. I had a definite idea in mind in 1908. It was a piston in which the slot ran all the way around the top, and it had a slot

somewhere between the wrist pin bosses,

I made some drawings or sketches in 1908, and took the matter up with the engineering department of Amplex, but it was found to be impractical in a two-cycle motor. I can't name any particular one I took the matter up with. It was given consideration, though, by the department. I know it was given consideration by the department because I talked to different ones in the department about it and in the experimental room.

I never made any pistons like that until 1911. I never made one that was slotted clear around the top

until 1914.

From about the year 1908 to 1911 nothing was done with the pistons of those types. The sketch of the piston was made in January, 1911, but the piston was not made until later.

The 1911 sketch was very similar, well, it is the sketch indicated in Exhibits 36 and 37. That particular sketch was made in January, 1911. I am positive of that.

Q. So from 1908 to January, 1911, you really did nothing about it? A. No, I didn't make any more sketches.

Q. Did you file any application for patent for inventions during that period? A. Not on the piston.

Q. Not on the piston, but you did on a number of

other things! A. Yes.

Q. Do you remember about how many—I don't want to find out what they were,—if there were some, or just how many? A. No, I don't know how many, but quite a number.

Q. Quite a number between 1908 and 1911? A.

Yes.

Q. And you weren't financially embarrassed during that period? A. Well, I wasn't financially flush, either.

The company paid for the applications. That was true of the rear axle construction on which we were in litigation with Packard. The company paid for that, the Amplex Company whereby they would pay for the patents, and in case of insolvency it would revert to me. They paid for

all the patents, for the use of them.

My suit against the Packard Company was by me personally, because I owned the patents, had bought them back, and paid for them in each either in the latter part of 1912 or the first part of 1913. I bought it from the manager of the Ampler, William Meade, paid him \$1400.00 in each for it in Chicago and brought suit against the Packard Company. That was either in 1912 or the first part of 1913.

During the period of 1908 to 1911 I wasn't so financially embarrassed but what I could have made applica-

tion for patent on this split piston, like Exhibit 51.

In a general sort of way, as far as the idea of aplitting the skirt was concerned, the idea wasn't any further advanced in January 1911. I had my idea all built up as to what I wanted to do with it, and how I wanted to do it. But as to the real finally developed design, that had not been carried out.

There is a difference between Exhibit 51 and 36, as far as principle of operation is concerned. 51 is a later development. 36 was of course a developed job for the purpose. That had ribs in it extending from the head down to the bosses. The bosses do not join with the skirt. The webs extend outwardly from the wrist pin bosses to the skirt, in Exhibit 36. There is nothing like that in

Exhibit 51. 51 was later, and was experimental with the

standard piston.

In 1911, in addition to making the sketch Exhibit 36, trying out a motorcycle piston like Exhibit 48, and trying out the piston with the Renault car of the same construction as Exhibit 48, which car I ran for a period of four months, to the extent of 3,000 miles with those pistons in it, I tested out a second motor on the block, a second Excelsion motor.

Q. Now I want to get straight on that. The motor you tested out on the block was not the motorcycle piston? A. The motorcycle piston was tested out on the block first merely to determine what the slotting would do, not as to the ability of the piston to stand w; because it wasn't mechanically expected to stand up, when it was cut all to pieces; it wasn't expected, that wasn't what it was to find out: it was to find out the action of the splitting. Then to further carry out the idea so that it came under my observation and the observation of my mechanic, a set of the pistons of the type of Exhibit 48 were constructed and tested on a test block and then put in the Renault test car for the purpose of determining what would take place and how they would operate under road driving. But it was not expected that the piston, not being designed for the job, would stand up; it wasn't expected it would give perfect results. As far as strength was concerned, it wasn't designed to be out all to pieces. The object was to see what would happen as to the splitting and slotting to prevent slap and soil ing. It was tested on the block and then put in the car and driven until November for the particular purpose of testing; no other reason than testing; no other purpose than simply for having a split skirt, and for having the idea of the split skirt. The second motor followed the motor put in the ear, and that motor was put on the test block, and that motor was run, the pistons the same as 48, but the instructions were to run it until it broke it down, not particularly to break the pistons down, but to break it down to the point of whether the pistons would split, and to see what would happen. And it was run indefinitely until the break came, how many hours, I don't know. But it was run at high speed until they broke the botts on the fly wheel, and as soon as the bolts broke on the fly wheel, the fly wheel flow off and it wrecked the motor and cracked the crank case around the rear bearing; and that was the end of the test. But

the pistons, fortunately, as far as strength was concerned, didn't happen to break up. But there was no signs of scoring whatever under that test. That is the only thing we were after, was the idea of piston slapping and scoring, not expecting the piston to stand up as a practical thing, because it wasn't designed for the job.

Q. But it did stand up? A. It just happened it did. That wasn't a commercial job; it wasn't a job anybody could manufacture and sell, because it wasn't designed for that purpose. It was a make shift idea to test out the idea of the split and how it would function.

(Narrative continued) First, we made the block test on the first motor, then the car test, then the block test

on the second motor, No. 2 motor.

Right following the installation of the motor in the car, in the latter part of June or in July, we made the second block test. It was done within a week. A motor was on the block, and then a week after the motor was installed in the car the second motor was on the block, the No. 2 motor.

The pistons that were block tested in the first block test and in the first motor, were the same pistons that were in the Rensult car. It is the same motor and the same pistons were built and put in the motor that was in the Benault car and block tested. Then the motor was put back in the Rensult car, the same pistons, no second set was put in that motor. The No. 2 motor was a different motor. Then the second block test was started with a different motor after the first motor was put in the Rensult car.

The first test was the motorcycle test. That was as far as that went. The third test was the last motor, the second automobile motor. The first test of automobile motor was the block test; then the motor went into the car; then the car was driven in the road test. That is why they were put in there. Then a second motor was built shortly after; that is, not built for the purpose, but a second motor installed for the same kind of piston, and that was on block test so it could be under observation as well as the car on the road was under our observation.

Q. And the second block test with the pistons of the sort of Exhibit 48, that turned out satisfactory, too? A. That turned out satisfactory as far as the slotting or

splitting was concerned, and seizing and piston slap. It didn't break down, but it wasn't a satisfactory design.

It wasn't a practical design for the job.

Q. It wasn't a practical design, for you hadn't designed it in the first place for the slitting? A. I had designed it in 1911, but hadn't any special patterns made to cover the particular purpose. This was merely a substitute to find out what the effect of slotting would be.

(Narrative continued) The changes I contemplated making were the same as in January 1911, when it came to actual design to properly fit it up. That is, with the web structure. I never contemplated using a piston like Exhibit 48 at all in commercial practice, because it wasn't practical in design. It was very light in structure after it was split down, there was nothing to hold it to form; it was just a happenstance it stayed together. I thought it needed webs and thought it needed different things to get practical results from practical and mechanical design. In other words, similar to the design in January 1911, and like my later design Exhibit 32.

If you don't want a piston without a web, I can't see anything wrong with the design of Exhibit 48, as far

as general proportions are concerned.

If you don't want to use any webs in a piston, I see nothing wrong with the design of the piston, from the standpoint of strength of materials and proportions, if it wasn't slotted.

Q. Well, you didn't find it wrong when it was slotted? A. I didn't find it wrong; it was just a mirecle it stood up. I wasn't testing it for its strength; I was testing it for its ability to take care of the slotting.

Q. You say it is a miracle. Is it an actual fact that

none of those pistons broke! A. One broke.

Q. Where! A. Broke through the center bore,

through the slot.

Q. You said yesterday that might have been an inherent defect in the casting. A. It might have been, but the fact is that if broke; whether it is a defect or whether it is a break. The steel might have been spongy at that point, but still not putting it under a magnifying glass, you couldn't see it; nevertheless, not being sound metal, it might have broken like other pistons do break.

Q. It might have been true of the web construction?

A. It might have been.

Q. But as far as that particular design like Exhibit 48 that you actually fully tested twice and one pieton was block-tested and then run for three thousand miles, you didn't find anything wrong with these pistons from the

design standpoint now, did you! A. Yes.

Q. What was wrong with them from the design standpoint? A. They weren't designed for the job. They were liable to let loose at any time. The fact that one did let loose was an indication under severe and continuous service more might have let loose if driven hard enough and far enough.

Q. In those days pistons let loose in commercial cars in three thousand miles? A. They let loose in a lot less

than that; and the same thing happens today.

(Narrative continued) In those days, in order to determine if a piston was practical, there was no given miles at which it had to be run. They were put on the test block, fitted with normal clearance, and they would run during 24 hours, night and day continuous; in other words, run perhaps three hours on a light load to break them in, then four or five hears under a certain beavier load, and that was continued on up until they took the last two or three hours under full load; if the motor didn't develop any trouble under the last block test load, under the heavy load, no overheating or no signs of piston trouble that the tester could determine, and if they were expert operators they didn't need to tear the motors down to find out, but could tell without doing that, why, that was proof enough that everything was going along in good condition, and then the general operation was to open the pistons at the base of the motor and shove them up to the top of the head, and then to examine the cylinder walls, and if no signs of metal sticking to them, or other indications, that motor was considered good, supposedly that motor was considered good enough to drive them in the car. They might have been driven two days in the ear, or it might be driven all summer, or that ear might not be driven maybe two days on the road, maybe 100 or 150 miles, maybe less and be reported in by the driver that it is O.K., and it goes out to the customer, and he may not drive it 500 or 1,000 miles, when he comes back with a holler that it has a frozen piston, and he can't account for it; but it did happen, and it does happen today yet.

In 1911 it happened with the solid type piston, not with that piston it didn't happen. We didn't have any

freezing or give out in any form.

Q. But the test you gave in 1911 with the Renault car was a good deal more rigid than any test given in 1911 before a car was turned over to the customer as a good piston and a good car? A. No, it wasn't any more rigid because I didn't have the ability to test it any different. I didn't have the ability. The block test on the first motor was short, maybe a matter of 24 hours. That was sufficient to show it didn't seize or score. That was the main thing I was after, to avoid piston slapping or seizing. It didn't do that all right; but I knew the piston wasn't designed and wasn't right for the job, and one of them did give way on the first motor; the No. 2 motor didn't give way, and did its work, did its work satisfactorily. That is all right with that individual motor, but any engineer or practical mechanic would know the piston was not properly designed for the job as a commercial affair; as an experiment, it was an experimental piston.

Q. You say that just because you took a factory piston and split if! A. I say that because I took the factory piston and split it; it wasn't designed for the job; it wasn't practical; no engineer in the country would say that was a practical piston to sell; it wasn't practical; I wouldn't think of putting anything out like that in manufacture. It wasn't fitted for the job. If you took the piston and redeligued it for the inside, redesigned it with the ribs put in such form, changed around with the ribs it a more practical job, to make it a real job; but that pisten couldn't, as it was, be sold and form a practical bout of it. But the purpose was to demonstrate its ability to do what it was supposed to do to a certain point. How far that could be carried, I don't know. In point. How far that could be carried, I don't another one of it was carried four thousand miles; in the block test it

howed its ability to stand up.

Q. You were perfectly satisfied with its performanes, weren't you? A. I was satisfied with its performance at far as slotting was concerned, but not with the other parts.

Q. Not with the design? A. Not with the design.

(Narrative continued) I was satisfied with the design a little later; I was satisfied with the design made in January, 1911, in that it would have been a much better type, and the later refined job in 1914 Exhibit 32 I considered pretty near the last word at that time in design.

In 1914 I had castings made of Exhibit 32, but I never had them machined. I saw the castings in November, 1914. It wasn't much of a job to machine those castings. I can't say what month the patterns were made for that job. It was after the drawings were made, of course, but just when the patterns were made, I don't know; I can't remember. We had the castings; they couldn't be machined because the company was in the hands of the receiver. By the time I got the castings the company was in the hands of a receiver. I was away when the castings came in; I was away in the East; when I came back I saw the castings.

I was interested in those pistons to see that they would turn out all right. I could have had them machined if the concern hadn't been put in the hands of a receiver. I expected to have them machined because we expected to get the company back into our hands, but I couldn't go shead with it without capital. Not having the shop in my hands where I could have them machined, that is

what held it up.

During the latter part of 1911 I made an effort to file application for patent. If turned the sketch 36 over to James Offield. That was in the fall of 1911. It was in 1911 or the first part of 1912; I will place it that way. It was right close to 1912. Ham positive that it could not have been 1913. Ham just as sure of that as of the rest of my testimony that it couldn't have been in 1913.

I testified in interference proceedings in the Patent Office, and my memory was probably fresher in 1926 than

it is now.

Q: On pages 47 and 48 of the record in the interference proceedings, in Interferences Nos. 49,569 and 49,570, and 49,571, you testified as follows: "About what were the dates that you showed Exhibits 1 and 2 to Mr. Offield and Mr. Pond? A. Exhibits 1 and 2 were turned over to Mr. Offield, as near as I can recall, in 1913." You may examine that. You testified like that? A. That is all right.

Q. Your mind was fresher? A. It might have been and it might not have been. I might have made a mistake in that testimony. I do recall though, however, that this Exhibit 36 was turned over to Mr. Offield while he was in the old office. That was while I was with the Exchaior Motor Company. That I do recall. That other testi-

mony there, I probably was not clear on.

(Witness continuing) My mind might have been fresher in 1926 in some ways, and on the other hand there are some things that I remember new I didn't remember

then, when the testimony was taken.

No sketches or drawings like Exhibits 32 and 31 were ever turned over to Offield, but I did turn over sketches of the sleeve valve motor to Mr. Offield. It was that same type sleeve valve motor, but no sketches dopied from that, but similar to it. Those sketches did not have an illustration of a piston on them. They were just sketches of the sleeve valve motor itself. The reason for that was the sleeve valve motor was started two years prior to 1911.

I got the original sketches back.

I don't know how long Mr. Offield had those sketches Exhibits 36 and 37, the sketch and description. Mr. Offield was in the old office and was separated from the parent company and went in by himself. He had them a number of months; I can't say how long. I couldn't get any action out of them, so I finally turned them over to Pond. The old name of Mr. Offield's firm was Offield, Towle, Graves & Offield. That was the firm's name in 1911. That was the firm that did all my work from 1907. I never knew the firm by any other name than Offield, Towle It was originally. I think, Offield, then it was Offield, Towle & Graves; then Offield, Towle, Graves & Offield; that was the junior Offield. Pond was the man that did all my work in their office.

I don't know when Mr. Graves became a member of that firm. I know he became a member at any rate. I said it was originally Offield & Towle, then Offield, Towle & Graves, and then Offield, Towle, Graves & Offield.

I don't know whether Mr. Wilson was with that firm at that time. I met Mr. Wilson after he became associated with Mr. Pond. I never knew him before that. I suppose his name was Ira Wilson, but I don't know.

I asked Mr. Offield to file an application for patent. The application was filed. I must have paid him for filing it or he wouldn't have filed it. Somebody filed the application; I don't know who filed it, but I know there

was one filed.

The application filed was on the motor. He never filed the application on this particular piston. Either Offield or Pond filed on the sleeve valve motor, or the other office did; but the application was filed on the sleeve valve motor. A patent never issued on that application.

I don't know when the application was filed. The papers were turned over to Offield in 1911, but I don't know when the application was filed. I have no means of knowing when it was filed. I don't know when it was filed. I turned them over the latter part of 1911, or around about the first part of 1912 to Offield, but I don't know when he filed the application.

I never turned over a drawing to him like Exhibit 31. That was a sleeve valve motor of the same general type, but the drawing was not like that. The drawing simply showed the construction of the motor, same construction as that, but not detailed like that; that was a working detail; that was a model of the real motor. This is a cross-section of the motor. Exhibit 31: that is what I turned

over to Offield.

Exhibit 31 is further developed than the drawing that I turned over to Mr. Offield to make the application from, so far as detail is concerned, but not the principle. It was my practice to turn over to patent lawyers the best design I had; and the design was just as good as that, but the detail was not so fine; it showed the very same working parts. It did not show the piston. It showed a piston inside of the sleeve valve, but that drawing was made two years prior to 1911; that drawing was made before I was to Chicago in 1910. It mean the sketches of the sleeve valve motor.

I did not have in my possession at that time a drawing or blueprint like Exhibit 31. At the time that I instructed Mr. Offield to go ahead with that application on the sleeve valve motor I did not have a blueprint, but I had a drawing which showed the valve construction, the same type of construction as is on that drawing, but it was not like that drawing as far as appearance was concerned; it was more crude; it wasn't there in detail. In other words, Exhibit 31 was made in 1914; I didn't

have it at that time.

Mr. Offield then filed the application on the sleeve valve motor, but he never got to filing the application on the piston. He had it five or six months, possibly more; I don't know how long. Mr. Offield at that time, after he had separated from the parent concern, it was in his possession until after he had separated. I don't recall that he had anybody in partnership with him; he wasn't giving much of any attention to his office or his business. Most of his time and attention was given to the Wrigley outfit and by various correspondence and taking it up with him whenever I was in Chicago, didn't de-

velop anything; he didn't get anywhere; never had the

time, and he never was settled in his office.

· I haven't any of that correspondence now. It was burned up in my house in Mishawaka, burned up with a lot of other correspondence. That is why I have no correspondence with the Packard Company. I haven't looked for it at the Amplex Company or the Excelsion Company because they have been out of business for years. I haven't one scrap of correspondence with Of-

field or Pond or anybody else.

Exhibit 36 was given to Mr. Offield. The sketch and the description as they are attached together here was in Offield's possession. He didn't return them to me by mail. I went to his office and couldn't get any action, and in talking it over with him he told me he wasn't able to get to it, and I saked him if he had any objections to turning it over to Pond, and I don't recall whether Pend was in by himself with Wilson then or whether he had left the old company of Offield, Towle, Graves & Offield which he was then associated with, and he had been associated with when he was doing my work prior. Offield had no objection. I went down and saw Pond and he was willing to take it over. Now whether I took the papers myself down as I recall it, they were both on the same floor, gight close together—whether I took the papers down to Pond myself or whether I instructed Pond to go and get them, I couldn't say positive, but they were turned over to Pend from Offield's office, either through me or by Offield himself, or Pend possibly might have gone up and got them.

I would say that Pend must have got them in either 1912 or 1913; they must have laid in Offield's office for

maybe a year or better; I den't know how long they laid in Official's office. I don't remember. I don't remember

I don't know how long I kept after Mr. Offield to file the application, possibly six months or a year; it was a long time. I don't know how long it laid there, and I don't know when it was turned over to Pend.

I don't know how many applications for patents I filed in 1912; in 1912 there weren't so many. No, I don't recall in 1912 filing any particular application.

Pond was the only patent lawyer I dealt with in 1912. After that they took the step from one firm to the other; that was the only firm I dealt with. I know other patent lawyers, but I didn't deal with them.

I was in and out of Chicago at that time. I presume Chicago is full of good patent lawyers, but I didn't know many of them. Practically the only ones I knew in Chicago were the Offield, Towle, Graves & Offield outfit, and the Hibben, Davis & Machuley outfit.

(Short recess taken.)

Q. Since when has Louis G. Vanderlip been prosecuting your applications?

Mr. Richey: I object to this as immaterial. It

seems to me we are going pretty far afield.

The Master: Oh, I think he may answer, and you may have your exception.

A I think he started. I think he did my first work in about the year 1917.

(Witness continuing.)

He is a patent lawyer in Elkhart, Indiana.

As to the firm of Wilkinson, Huxley, Byron & Knight of Chicago, the application on the ornamental engraved metal and method of producing the same was filed with them. They were the Conn Gompany's old original patent attorieys, and it was their wish that I continue with them.

I became connected with the Conn Company late

in the fall of 1915.

After I turned the aketches in question, Exhibits 36 and 37, over to Mr. Pond, they also laid around his place. He might have taken action on the matter; it might have been him that filed the motor application; that I don't know; but there was nothing done on the piston application. I asked him to file an application on the piston.

I think it was around 1912 or 1913 that those papers were turned over to Mr. Pond; somewhere in that neighborhood; I don't remember the date it was turned over; between the period of the latter part of 1911 or the first of 1912, and the time in which he turned them back to me.

Third the any applications for patent on other things during 1914 that I recall, and I can't recall what

was filed in 1913.

I know this motor was filed somewhere back in the neighborhood of 1912, but I don't know just when or where or who by.

The fifty old patents which I took out were spread over a period of twenty years. They went back as far as

I would say, as 1888, '88 up to, well, up to three years ago, two or three years ago, four or five years ago, something like that. I am taking out patents all the time, but I can't tell where they are strung along or what they are.

I was not in a financial position to make application for patent on this piston during the years 1912, 1913 and '14. I borrowed the \$1400.00 to give to the Amplex

Company for patents.

Q. You couldn't have borrowed enough money to file an application, could you! A. I was just about down as low as any when I bought that. That is what I considered my salvation in getting that back.

(Witness continuing) I paid for that Amplex car in 1914. It was around \$600, I believe. I raised that cash and advanced it to the company and more than that in the fall of 1913, late in 1913, about the first of '14 and up until the time I took the car, or just prior to the time I took the car.

I was not drawing a salary in 1914. I had nothing to live on except what I had coming in, borrowed a little from my latter, and I borrowed a little from my wife. I borrowed from my father to buy that patent

with. I had no property.

I raised enough money to file an application on the sleeve valve motor; I don't know where I got it. To my knowledge, that patent was never issued.

This experimental piston, Exhibit 51, was put into a

Buda motor in about the middle of 1914.

Q. You mean the Buda motor in the Amplex car? A. Buda motor in the Amplex car, and was driven as an experimental proposition until about the first of Novem-

ber, 1914

Q. That is your opinion that it was an experimental proposition, isn't it? A. It is not my opinion; it was purely experimental; that is all that was put in the car for, not as a manufacturing proposition; purely as an experimental proposition, to determine what the aluminum piston with the split idea on it would do so it could be under actual observation under road conditions, under normal driving conditions, and in driving conditions so it could be under my observation and the observation of my employees.

I have had quite a good deal of experience with patents. I know patent laws only fairly well. I don't know

as I know what the prerequisites of a valid/patent grant are, or what is necessary that I should or should not have done.

Q. Well, you know one of the prerequisites is that it shall not have been in public use for more than two years before the filing of your application? A. It was not in public use.

Q. Yes; it was not in public use—I say you know

that was the law? A. I do not.

Q. You didn't know that at all before today? A

I didn't know that was the law.

Q. You didn't know if a thing had been in public use for more than two years before you filed the application the patent would be absolutely invalid? A. I didn't know that, and this was not in public use.

Q. I have not asked you that at all. I asked you

if you knew that. A. I did not know that:

I didn't know that of the fifty patent applications which I signed, every oath carried that statement in it, that the patent had not been in public use. It was never brought to my attention before. I never read that oath before. I don't know that I read that oath in all the fifty patent applications I filed.

I said this was an experimental piston because it

was nothing else.

Q. What is the definition of an experimental piston, in your opinion? A. An experimental piston is a piston you are experimenting with to determine the results of any improvements. A fully developed piston that is manufactured and put on the market is a perfected item. That was not perfected as far as construction was concerned. I was trying to determine from an experimental standpoint and actual tests what an aluminum piston with a split skirt would do, whether it would perform all the services I expected it to perform, which it didn't perform in gray iron.

(Narrative continued) I did not talk about these things with anybody last night after I left this room.

I have not been told by anybody that an experimental piston is a safe thing under the patent statute.

Q. You didn't bring up this matter of experimental piston yesterday, did you! A. I wasn't asked.

Q. You did say yesterday that the pistons, all of those pistons, the one in the Excelsior car in 1911, the

one in the test block in 1914, and one in the Renault car in 1914 operated to your entire satisfaction? A. I did not say that.

(Narrative continued) I said that the piston in 1911 as put in the Renault car, and the test motor that was run in 1911, operated satisfactorily as far as the split skirt idea was concerned, that was all. While they did stay together, that was all, and the pisten that was operated in 1914 in the Amplex car, in the Buda motor, operated in road tests also satisfactory, but was not a practical or mechanically constructed proposition as a merchantable article, but it did operate as far as the splitting was concerned and as far as seizing and piston slap were concerned. That was all I was interested in, was to test it out. It was purely experimental; it was not put in the car for the purpose of simply having a set of aluminum pistons in there, because al minum pistons weren't in vogue at that time. It was put in there for the purpose of finding out things. That is what I did find out, as far as I was able to observe it, it was under my personal observation, and the man who installed it, every day, when the car came in the abop, he always had it open and always would listen to it. That was one of the ways a good mechanic could tell, by the sound, to determine whether it was going right or wrong. My opdetermine whether it was going right or wrong. My op-eration of it on the road was to observe how it went along the road, what the fiel consumption and oil consumption was, and how it compared with other jobs as to oil con-sumption, and how it ran, but its asset up to me, as long as it was running all right, to take down the pistons. If you had two or three motors and could have one on the test block, run one there, and have another one on the road, and run it all day long, it would not have been necessay for me to drive the car so much, but I drove the car to put mileage on it so that it would be under my observation, and that was the reason that I drove the ear so much as I did. Another reason, so you may understand the situation, when the pistons were taken out of the car, I was going to sell it. I had no idea the company was going into the e hands of a receiver. If the comda't gone into the hands of a receiver, those pispany be tons would have been placed in a single motor, in a Buda motor, in a runabout. I was a single man and I had no need for such a large car. But when in November the company went into the hands of a receiver, everything went out of my hands and that ended the plans, and that was the history of the run of the Buda motor, ...

Q. During the run of 3,000 miles of pistons like Exhibit 48 in the Renault car, you just kept close track of it to see how it operated? A. Every day that the car came into the shop.

Q. And it was listened to? A. It was listened to by me. When I would get out of the car I would always histen to it. I was always listening to it when I was driv-

ing.

(Narrative continued) I opened the engine up once to see whether it was possibly scoring the cylinders: Opening it up once in 3,000 miles was sufficient; no other manufacturer would attempt anything different when he had the car on the road; it isn't the practice. That once was when the piston was broke; it was opened up before that when the crank shaft broke. It was opened up twice. The crank shaft broke, and it was opened up. You could see inside, see up the piston walls, see they were perfect cylinders; that was evidence the pistons weren't scoring, or it would show on the side wall. It was opened again when the piston broke. That is the last time it was opened until they were taken out.

The piston in Exhibit 51, the 1914 piston, as placed in the Amplex car was never given a block test. The design of the piston was a standard piston; the only addesign of th dition made to it was the ribe extending from the boss to the head to provide strength enough to keep the pis-

ton from breaking in two.

Q. You really redesigned that piston then, didn't you? A. I did not redesign it; I merely added the ribs to give it strength. There was no ribs above the boss in the old piston pattern; if the slot had been cut around, it would have cut the piston completely in two. The ribs were merely added to tie the skirt to the head.

Q. And no attention was paid at all to strength of materials or design to take care of the atresses and strains that would be encountered? A. Well, the ribs were slightly heavier than they would have been made in gray from under the same circumstances, but there were no ribs in the original gray from. It was the gray from piston pattern, simply the ribs in there so it could be cut in so it could have been slotted around the top. Without that there would have been no skirt left, if it had been cut in two.

Q. You say that was not a commercial piston? A. It was not. It was not designed for commercial purposes; it was not designed at all; it was merely a make-

shift thing for experimental work.

(Narrative continued) None of those pistons gave way in the car. I don't think it was a good design, from a mechanical standpoint or a practical standpoint.

I don't know of any aluminum piston in 1914 that. would stand up under 4500 miles; I didn't know any aluminum pistons were being made at that time particu-

larly: only in an experimental way.

Mr. Pond did not just keep that drawing of the piston until it was turned over to Mr. Winchester. Mr. Pond had Exhibit 36 in his possession until I called for it in the latter part of 1913 or the early part of 1914; then it was turned tack to me, and I showed it to Mr. Winchester so he could get an idea of how the piston should be designed for the new motor. It was turned back to me later on, I imagine in the latter part or in the middle or latter part of '14, probably the latter part of '14. I presume I again asked him to make application for patent on it. He didn't do anything about it at that time because I had no money to pay for it.

I don't recall of other applications that were filed by me in 1914 and '15 and the first part of '16, but close to that period there were some applications filed relative to other automotive parts, not far away from that; but I don't recall just what year they were in. I believe I filed one in 1916 but I don't recall filing any in '15 or '14.

I gave Mr. Poud both the sketch and the description, Exhibits 36 and 37, after Mr. Winehester got through with them, and they were given to Poud when Win-

chester got through with them.

Mr. Pond never had the drawing, Ethibit 32, the details of the piston that Mr. Winchester made, to my knowledge. He might have had it or might have seen it, but I don't recall of his having it. He didn't do anything with it, and the whole matter was turned over to Mr. Tibbetts in March 1916.

Q. Now, your position is that the Renault car piston like Exhibit 48, the block test of that kind of piston and the motorcycle piston, and even the piston in the Amplex car like Exhibit 51, was just run to determine in your own mind the satisfaction that the piston would give? A. They were to determine in my mind from an experimental point the satisfaction the pistons would give from the idea of splitting the skirt and the slotting, not from the general construction.

Q. And it took all those runs for you to determine that, each time determining it over and over again?

A. It took all of those runs, and it would have taken more had I had the time and the opportunity to carry it still further.

Q. As far as the 1911 piston was concerned, you just threw that in the scrap heap? A. Threw it in the scrap

heap.

Q. Didn't do anything further until 1914 to make an additional piston! A. No other pistons were made until 1914

Q. In 1914 you permitted them to be also thrown -

into the scrap heap?

Mr. Richey: I think that is immaterial. He has already testified to the facts. Now he is asking him for his conclusion on this. It seems to me we are going over and over the thing. I object to the question.

The Master: Overruled. He may answer and

you may have the same exception.

A. They were thrown in the scrap, but they weren't

thrown into the scrap with my permission.

Q. You weren't sufficiently interested to follow up these, to locate them? A. I was, but I couldn't locate them

Q. You made no effort to locate them? A. I did. Q. The 1914 piston? A. I did.

Q. You tried to find out what scrap man got them? A. I tried to find out where they went. I found out they, went into the scrap. That is as far as I remember. I

had other things to attend to.

Q. You never tried to trace who the scrap man was? A. I did. I tried to buy the whole outfit back, putterns, pistons and the whole business. It was understood for some four or five months we were going to get the factory buck; consequently I didn't spend my time searching around the factory. Later I was advised they were scrapped, and consequently I had no chance to get them there.

Q. You never found the name of the man who got them, the scrap man? A. Yes, I presume I did. I understand the greater portion of the scrap was sold to a

South Bend serap yard.

Q. Did you go over there to see if you could find

them? A. No. I did not.

Q. In other words, after all the tests in 1911 and 1914 you weren't sufficiently interested to go over to the South Bend scrap yard to find the pistons? A. I was, but I wasn't able to get around to it.

Q. You didn't have a single drawing of the 1911 and 1914 pistons in your possession. I am excluding now the pistons like Exhibits 36 and 37 with the webs on them: I am limiting myself to those pistons that were actually put in the cars in 1911 and 1914. A. I had no sketches of those.

(Narrative continued) The Packard negotistions extended from March, 1916, until somewhere about November, 1917. My application here was filed November 30, 1917. The negotiations were closed long before the patent application was filed. The negotiations were closed in 1916. The money was turned over to me in 1916. The patents were negotiated for in 1915, turned over and delivered to the Packard Motor Car Company in 1916, and the settlement was made in 1916, if I am not mistaken.

Q. I want to refresh your memory. Mr. Tibbetts' letter to you, first letter to you, is dated March 27, 1916. On May 18, 1917, you wrote your last letter to Mr. Tibbetts asking him when negotiations could be closed, Those letters are in evidence. According to that the negotiations were really started in March, 1916 and ended some time after May, 19171

The Witness: The negotiations were started earlier than March, 1916. They were started very close to the first of the year 1916, and I had forgotten that the negotiations wasn't finally settled; they were held pending on a lot of old patents. If the money wasn't turned over until 1917, then of course that is when it is, but I was under the impression.—I couldn't remember exactly,—but I was under the impression that the whole deal was closed some time in 1916, the latter part of 1916.

My application was filed November 20, 1917, and was executed around the same day. The settlement was com-

pleted and the money was paid over prior to the applica-tion of the patent, some little time prior; I don't know

just how long.

During these negotiations, or from March 1916 to November, 1917, my financial condition was not such that I could have filed an application for patent. I was employed by the Conn Company, and I was getting a salary, but my finances were very low. I couldn't state how much per month my salary was in 1915, but it was not several hundred dollars a month, nor was it several hundred dollars a month in 1916 and 1917.

I think I filed one application in my own name in the fall of 1916 or in the early part of 1917. I raised the money for that. This particular piston was not involved in the receivership. That was my own personal property. There never was any question raised about that. The Packard Company never raised any question as far

as that particular piston was concerned.

There was no drawings made of either of the pistons, Exhibits 48 and 51, during the years 1911 to 1914. I directed the making of the patterns, but there was no patterns made. I directed the putting in of the ribs in the core-box. I did not stand over the pattern-maker as he did it, but I showed him how to make it and he put them in. I told him werbally, and very likely I made a few marks on a piece of paper, showed him how the ribs were to be put in. No drawings were made. The same kind of verbal directions were given to the gentleman who slotted all of the 1911 and 1914 pistons.

I had perhaps two conferences with Mr. Milton Tib-

betts of the Packard Company in 1916.

The rear axle suit was settled prior to negotiations

for these patents.

As to the Packard negotiations, Mr. Tibbetts and I had lunch in the Auditorium Hotel in the winter, and I think that was either in the latter part of-I think that was in the latter part of '15; I am not certain and I explained to Mr. Pibbetts at the time the sleeve valve motor idea, and another motor idea also of a double-acting motor, and also the pistons. Mr. Tibbetts just at that time was not particularly interested because he had no drawings to see; he didn't know just exactly what I was driving at with these motors in particular, but he did get an idea of the piston, and these other putents which they wanted to buy which had no bearing whatever on this piston; only on this sale which was in process. I was endeavoring at that time they had made a proposition and I was endeavoring to secure these patents, and as they went along with the negotiations, I made them a proposition to take over the motor idea as well as the piston, take over the whole business; therefore their proposition covered the whole contilt; and the merotia: tions were carried on from then for some length of time until I was able to secure the old patents.

As far as the piston is concerned, what I turned over to Mr. Tibbetts were sketches Exhibits 36, 87 and blueprint Exhibit 31, among other drawings. I also gave

him the description, 36 and 37.

I told Mr. Tibbetts the whole situation in the Auditorius Hotel. I don't know that I went into all of the details of the tests, but I did tell him that I had tested the pistons with the split skirt, both at the Excelsior Company and also in Mishawaka. I didn't go into details as to how those pistons were constructed. I told him how the split skirt idea worked; that is all I was interested in. all he would be interested in. I couldn't say as to whether or not that was the only time those 1911 and 1914 pistons were mentioned to Mr. Tibbetts before the negotiations closed I might have talked with him after our conference in the Auditorium Hotel. I might have talked with him on the subject but I can't recall what the nature of it might have been or the details of it. I didn't give him any sketches, drawings or samples of those 1911 and 1914 pistons that I actually made. What Mr. Tibbetts really had to make the application on was the data just contained in Exhibits 36, 37, 31 and 32.

Mr. Richey: By that you didn't mean oral de-

Mr. Bruninga: Oh, yes, I will add to it oral description.

The Witness: Mr. Tibbetts had only the description that I gave him at the Auditorium Hotel and what I might have given him after, if I met him afterwards, if I did meet him between then and the time I delivered these drawings to him. I would say I might have met him in between that time and talked with him, but I can't say exactly.

In 1926, when I testified in the interference, my memory on that matter might or might not have been fresher than it is today.

In 1926, in the interferences, I testified as follows, on pages 70 to 72 of the interferences 49,569, 570, and 571, upon cross examination by Mr. Kingsland, counsel for Mr. Hartog in those interferences:

"XQ. 205. Mr. Gulick, do you know who prepared the application upon which you are involved in this interference? A. Mr. Tibbetts.

XQ. 206. Did you furnish the data on which the application was prepared? A. None other than have been shown in Exhibits 1 and 2."

Mr. Brunings: Exhibits 1 and 2 correspond to Exhibits 36 and 37 in this case; and Exhibit 9 thereafter referred to corresponds to Exhibit 32 in this case.

"XQ. 207. In addition to that, had you had any personal conferences with him before the application was prepared? A. Only such conferences as were had pend-

ing our negotiations.

XQ. 208. Do you recall whether upon any of these conferences you gave Mr. Tibbetts any information relative to the subject-matter of the invention that would supplement or add to the disclosures of Exhibits 1 and 2! A. I have no recollection of such disclosures.

XQ. 209. Then so far as you now remember, the only information relative to the invention of your application given to Mr. Tibbetts was the contents of Exhibits 1 and 2; is that correct? A. The contents of Exhibits 1, 2 and 9.

XQ. 210. You desire then to correct your answer to XQ. 206 and add thereto Exhibit 9 as the extent of dis-

closure to Mr. Tibbetts; is that correct? A. Yes.

XQ. 211. To summarise the matter, then, Mr. Tibbetts, so far as you now remember, had before him Exhibits 1, 2 and 9 without any further information or without any other disclosures when he prepared your application; is that correct? A. It is not correct. Mr. Tibbetts had in his possession at the time Exhibits 1, 2, 9 and 10, from which he undoubtedly prepared the application. However, during the preparation of this application I did not have any conferences with Mr. Tibbetts."

Mr. Bruninga: Exhibit 10 corresponds to Ex-

XQ. 212. I understand from your last answer that you now desire to supplement or change your answer to XQ. 210 by adding Exhibit 10 thereto; is that correct? A. My first answer with reference to Exhibits 1 and 2, I was referring particularly to the written application in Exhibit 2 but not to all of the exhibits that were in his possession.

XQ.213. Have you now stated all the data that was before Mr. Tibbetts so far as you now remember at, before, or during the preparation of your application?

Mr. Richey: Objected to as incompetent unless this witness was present when Mr. Tibbetts prepared the application.

A. All of the written data that I know of, written

or printed data that I know of.

XQ.214. Do you know of any verbal data or information that Mr. Tibbetts had from you in addition to

the written or printed data at the time stated in the last preceding question? A. None other than might have come up in verbal conversation before or at the time I turned the exhibits over to him.

XQ.215. Do I understand from your answer to XQ.208 you have no recollection of giving to Mr. Tibbetts any additional verbal information in relation to the invention; is that correct? A. I have no recollection of having talked to Mr. Tibbetts or seeing him after turning over the exhibits until he forwarded the application to me for signature.

XQ.216. Did you give to any one connected with the Packard Company any verbal explanation in addition to the exhibits you have referred to in further or fuller explanation of the invention prior to the receipt of the application papers for your signature? A. I did not."

Q. And is that your recollection today, or do you wish to medify it? A. I don't wish to medify it, but I haven't made any statement I gave to Mr. Tibbetts any information after, any written information or any printed information, after I turned these exhibits over to him relative to the application of the patent. I never had any correspondence with him, nothing when he was filing the applications or when he was preparing the applications. I have no recollection of ever having been in Detroit during that time and conversed with Mr. Tibbetts between the time I turned these various exhibits 31, 32, 36 and 37—those are the exhibits that he had before him when he prepared the application—I have no recollection of having had any conversation with him. I might have met him, but I don't recall having met him between that time and the time the application was filed. But prior to that, prior to turning the papers over, I did converse with Mr. Tibbetts about the previous experiments, and that is what finally got him interested in wanting to take times devices over in connection with the old patents.

(Narrative continued) I told Mr. Tibbetts about the 1911 and 1914 experiments, about what I had done, at the Auditorium Hotel. I might have met him afterwards and said something to him, but I couldn't say positively; but I furnished him no information that I know of after turning over these exhibits, between that time and the filing of the application.

I did not tell Mr. Tibbetts I had made pistons like 48 and 51 in 1911 and 1914. I never explained to him how I had done it. I told him I tested out the split skirt idea. The type of construction which Mr. Tibbetts got

was Exhibits 36 and 37, 31 and 32.

The application for the Gulick patent in suit was forwarded to me at Elkhart, and I signed it. I don't know that I had any conference with Mr. Tibbetts at all before I signed the application. I couldn't say as to that. I don't know if there was any correspondence in addition to it or not. I read over the application and Mr. Tibbetts' letter. I don't recall telling or writing Mr. Tibbette that he left out the 1911 and 1914 pistons like Exhibits 48 and 51. I might have and I might not have. I know that when the application was sent to me, I signed it and sent it back. There might have been corrections made; I can't say. And I have no correspondence to show what did take place. I don't recall particularly any correspondence. I don't recall of any corrections being made to the application by me when I sent it back. There might have been some made and there might not. I went over the application carefully to see whether it disclosed what I had invented; I thought I was correct in my diagnosis of it.

I don't remember when I next heard from Mr. Tib

betts after the application was filed.

(Witness handed affidavit dated December 2, 1921, from file wrapper of Gulick patent in suit, which he reads.)

I recall signing that affidavit; this refere to Exhibit 32, and attached to the original copy from the Patent Office is a photostat of Exhibit 32, which is marked B-3.

I remember signing that affidavit.

There was no previous correspondence, between Mr. Tibbetts and myself between the filing of the application and the time of that affidavit, that I know of. I don't remember whether Mr. Tibbetts just simply sent me that affidavit and told me to sign it or not. If there was any correspondence, I don't remember it. If there is, the file would show it. I have no records to show for it. There wasn't much of any correspondence between the Packard Motor Car Company, Mr. Tibbet's and myself after 1917. All my correspondence was burnt up about the first of 1918. I have no letters or anything from the Packard Motor Company. I haven't a scratch of a pen to show any of my correspondence. There was

a lot of paper stuff in the garret, and they burned them up. My files were up in the garret, while they were overhauling the house.

I don't know just what the idea of the affidavit was.

Mr. Bruninga: Well, if you turn to the previous page, page 26, you will find the following statement:

"In order to anticipate the Examiner's rejection of claim 22 upon the patent to Schoengarth cited, we are filing herewith an affidavit of the applicant carrying the date of invention back of the filing date of Schoengarth. Applicant made this invention and made some of these pistons and successfully used them before Schoengarth filed, so that Schoengarth is no longer a reference." I want to say to you for your further information that the Schoengarth patent is No. 1,174,092, whose application was filed on October 1, 1915. Do you recollect whether Mr. Tibbetts sent you a copy of that patent at that time?

The Witness: I don't recall.

(Narrative continued) I do not know whether I saw that patent before that date, or not. I don't know that I ever saw it before today. This reference here refers to the split skirt only, this affidavit. By "split skirt" I mean that it doesn't refer directly to the ribs, how they were put in and attached to the bosses. It refers directly to the idea of the splitting of the skirt. I say that because it is right here, the description of it says so. It is on another page here somewhere, I saw it. That is referring to the splitting and alitting and not to the piston construction.

The Witness (reading from file):

"Claim 24 is similar to the claim 22 except that the adjacent parts of the skirt across the longitudinal slot are referred to as being entirely disconnected, which is not true of Schoengarth. This claim therefore is allowable regardless of the patent to Schoengarth as a reference."

Referring to the affidavit, page 27 of the File Wrapper and contents, the following quotation from the affidavit refers to a photostat that corresponds to Exhibit 32:

"that he made" referring to Gulick "or had made under his direction, drawings of said piston,

and described the same to others in this country prior to the month of October, 1915; that a blue-print of one of such drawings has been preserved and is now in the possession of the assignce of this application, the Packard Motor Car Company of Detroit, Michigan; that a photoprint of such blueprint is attached hereto; that the longhand notes on such blueprint which show in the blueprint were made by him on the blueprint prior to the month of October, 1915."

The original drawing from which that photostat was made, according to my information at that time and according to my belief, was made prior to October, 1915.

I looked at the date, 6-24-1914 when I answered, in

order to refresh my memory.

The affidavit further reads: "that said invention was incorporated in an automobile engine and successfully operated in the United States prior to the month of October, 1915."

There was no piston like Exhibit 32 ever incorporated in an automobile. When that affidavit was made, that was made to cover the split skirt idea. I was not hinging on the general construction of the piston at that

time.

I had told Mr. Tibbetts about the split skirt construction of 1911 and 1914, but I don't know as I ever gave him the details of how I had done it. The slit skirt I had was the whole idea; it wasn't the general construction of the piston; it was what the split skirt did. I didn't have to explain that to him; he was mechanic enough to know of what the split skirt would do regardless of whether it was mechanically perfect.

I told Mr. Tibbetts, at the Auditorium Hotel, that I had made and actually tried out a piston prior to 1915. In fact, I know I told him they had been tried out, split

skirt pistons had been tried out.

Heferring to the statement in the affidavit reading, "He doesn't know and doesn't believe that said invention had been in public use or on sale in this country or patented or described in a printed publication in this or any foreign country for more than two years pricate to his application," I signed the application, but that doesn't refer to public use. The pistons weren't ever publicly used. That was an experimental use purely. My idea was that that referred to the use of the piston for our experimental purposes, but not in public use. I

therefore felt warranted in signing the affidavit that it had not been in public use. I looked at that statement that it had not been in public use at that time; and the 1911 and 1914 pistons did not constitute a public use, but simply an experimental use. That is the reason I was able to sign that affidavit.

Q. But you did know in 1921 at least that the subject-matter of the patent should not have been in pubhe use for more than two years before you filed an application? A. Well, it was in use experimentally but not in public me.

Q. AWell, I mean you did know that that was a prerequisite of a good putent? A. No, I don't know that I

gave that part a thought, that feature.

Q. When you made the further statement in there: "and that he has never abandoned said invention," you did not consider that you abandoned those 1911 and 1914 pistons by just throwing them in the scrap heap? A. No, I never did abandon the idea.

I have no recollection of any previous correspondence with Mr. Tibbetts which would enable me to sign an affidavit of this kind. I have no correspondence to go by. If those files don't show it, I have no way of making a statement to that effect. I have no recollec-

tion now of any correspondence prior to that affidavit.

I knew what the purpose of the affidavit was; that is to a certain extent. I didn't figure Mr. Tibbetta would send me anything in the way of an affidavit that had any-

thing creeked on wrong about it.

I was not thoroughly experienced in patent matters. at that time; it is not my business, the patent law isn't; only my own experience in taking out patents is all I thought I there what the allidavit was about; but

perhaps I didn't. I have no recollection about it except

that the allifavit was signed.

Beforeing to page 32 of the File Wrapper and con-tents, there is a long amendment to the specification which cade on page 42, and is duted September 8, 1922. Then shipping over the Examiner's letter on pages 43 and 44, there is another induted amendment on pages 45 to 49. Then following that is a supplemental outh which was signed by me on November 8, 1922. The supplemental outh is pages 50 and 51 of the File Wrapper and contents. That is my signature to that supplemental outh on page 51. I signed that outh here in Cleveland—indicated on page 50. I signed the outh because my signature is on it. I have no recollection of any papers having been sent to me by Mr. Tibbetts between the time he sent me that oath that we have just talked about and the trip to Cleveland, other than these affidavits at the time that they were dated. The only affidavit sent to me, that I can recall, was the first affidavit on December 2. 1921.

I don't know how I happened to be in Cleveland on November 8, 1922, when that oath was signed; I can't say; I don't know whether I was going through here and stopped off here or whether I came here in connection with the first interference, or what it was; I can't remember what it was; I can't remember how I happened to be

here.

By Mr. Bruninga: Well, to refresh your memory and enable you to place your dates a little bit, the interference was not proceeded with until 1926, and the testimony was taken. If think that is right. Your testimony wasn't taken until 1926, and this oath is signed in November, 1922. Does that en-The Witness: No, I don't know how I hap-

pened to be here.

By Mr. Brinings: Does it help you if I call your attention to the fact that these was a certain interference between Hartog and Pomercy that had been decided in August, 1922, just a few months before you came to Cleveland?

witness: I never was advised of any of the interferences between any in this case anywhere.

(Narrative continued) I don't know what office I d that alldavit in. It was very likely in Mr. Watts'

ce. I don't know what office it was in.

During the interference proceeding, page 100 of During the interference proceeding, page 100 of Gulink's record in Interferences 49,569-570 and 571, I testified as follows: "RQ. 366 in whose office was it submitted to you! (Referring to the supplemental outh.)

A. Well, that I can't say because, to the best of my recollection the name of the institution was well, there was a Mr. Watts competed with it; I guess that in about all I remember, somebody and Watts, as Lyuetll. I don't know what the name of the humaness well, who the atterneys! office was but Mr. Watts, I guess, shill Mr. Slough. I testified to that, I just previously stated I thought it was Watts. I never met Mr. Watts, at least I den't know him personally. I have not met him vines I have him personally. I have not met him since I have been

here in Cleveland. I don't know whether or not Mr. Richey was present at that conference when I signed that supplemental oath. I don't think he was. I remember reading the application over as corrected.

At the time that I was in Cleveland I made a sketch like Exhibit 51 (referring to original sketch). The sketch that I made at that time is Gulick's Exhibit 11 in the Interference proceeding, and that corresponds to Exhibit 51 in this case. I don't know who asked me to make that sketch, Gulick's Exhibit 11. I was asked to make it there in the office to show how the piston was constructed and how it was need in the Amplex car. That was merely a descriptive sketch to show how it was done then.

By Mr. McCoy: The Gulick sketch referred to appearing as Gulick Exhibit 11 in Interference 49,-569-570 and 49,571 in the United States Patent Office, and previously marked for identification on page 1060 as Exhibit 33, is offered in evidence in behalf of the Plaintiffs as Plaintiffs' Exhibit 62.

The Master: It may be received.

Q. You then fold Mr. Watts about the experiment, or rather the piston that you used in the Amplex car?

Mr. McCoy: It was Mr. Ray S. Gehr, not Mr. Watts, so that the record will be straight.

Mr. Bruninga: I am perfectly willing to be cor-

rected.

(Narrative continued) I remember the name of Gehr. I remember the name of Watts. I was under the impression it was Watts. It was Mr. Gehr. I can't say that Mr. Watts was present; he might have been. It was the first time I was ever in the office, first time I ever met any of those men. I don't remember what building the office was in, but I think it was somewhere on Euclid Avenue. I recall the name "Gehr" but I don't know whose office that was.

Mr. Bruninga: What is the date of that? Mr. Bruninga: November 8, 1922.

Mr. Richey: Well, Mr. Watte' office was not on Enclid Avenue in 1922. We moved up to the Union Trust I think in the spring of 1925. Before that we were in the Ulmer Building and in the Bockefeller Building; so it must have been Mr. Gehr.

The Master: At this time we will recess until

1:30.

Thereupon the witness, Eswand J. Gruck, resumed the witness stand for further cross examination, and testified as follows:

Cross Examination by Mr. Bruninga.

I have a distinct recollection of making the sketch Exhibit 62 in Cleveland. Mr. Tibbetts wasn't present in Cleveland at that time, that I recall. The application was being taken over by some other attorney. The occasion for making Exhibit 62 was for description of the type of piston that was used in the Amplex car in 1914. I told Mr. Gehr or Mr. Watts about making that piston for the Amplex car. I did not give him a sketch of the Renault car piston, like Exhibit 48, at the same time, because he didn't ask for it. The information, such as was given, was verbal. I don't know just what the occasion was; I was asked to describe the piston that was used in the 1914 Amplex, and I made that sketch. What other questions were asked, I can't say; I don't remember.

I might have told Mr. Gehr or Mr. Watts about the 1911 Renault car piston, or the motorcycle piston; I don't remember exactly. I haven't any recollection of any previous correspondence up to the time of the conference in Cleveland. I don't remember whether or not I told either Mr. Gehr or Mr. Watts that I had run that piston in the Amplex car for between 4000 and 4500 miles in 1914. I don't remember telling either of them about

scrapping the 1911 Renault car piston, either.

I read over the amendment to the specification, at that time, as I stated in my supplemental oath, before I signed that oath in November. It met with my ap-

proval.

I attended the Elgin road races at Elgin, Illinois in August 1911. That is where I drove that Renault car in August 1911, with piston like Exhibit 48. I don't remember who was in that race. I don't remember the drivers' names. I think Barney Oldfield was one of them; I don't remember the others. I did at the time, I knew their names, but I can't recall them how.

I don't remember Gys Monckmeier; I never heard the name. I don't remember whether or not the Eddie Staver automobile was in that race. I was not familiar with the Staver automobile at that time. I was doing business in Chicago at that time. I had heard of the

Staver car but had never seen it.

I didn't see any piston that Mr. Monckmeier had in that car; I didn't know Mr. Monckmeier; and I have

never seen the Monokmeier piston.

I don't know who Walter Schoengarth is. I don't know that I heard of Elmer Long, not until just about the time of this interference, the patent interferences involved in the application of the patent in suit. I never saw any of Mr. Long's pistons before that time.

I never saw any piston being put out by Mr. Weens, of Quincy, Illinois. I never saw any pistons that were being put out in the Franklin automobiles from 1915 to 1920. I did not know anything about what kind of a piston the Kant-Skore Company, in Buffalo, was putting out. I did not know what kind of a piston the Maxwell Company was putting out in 1920, 1921 and 1922.

I never knew that the Aluminum Company of America was building pistons prior to the time I signed that

affidavit in Cleveland in November, 1922.

I knew nothing short the Franklin automobile agency in South Bend in the years 1916, 1919, 1920 or 1921, and I didn't know Mr. Venner that was connected

with that company

Beforeing to the Gulick record in Interference 49,569, page 10, in commenting about Exhibit 4 (Exhibit 45 in this suit), found on page 291 of that record, I made the following answer to question 61, reading as follows: "Q.61. Do you know where Exhibit 4 was made, or anything about its history! A. It was evidently made in the drawing room of the Excelsion Motor Manufacturing Company, and as the motor was designed by L. P. Money, Ubelieve that Exhibit 4 was designed by him."

Moore, I believe that Exhibit 4 was designed by him."

I knew something about Mr. Moore. I have reference to Louis P. Moore, of Cleveland. I knew Mr. Moore from about the last of Reptember, 1910, until about the last of 1911. I don't know that I have ever met Mr. Moore since he left Chicago. He never discussed any piston subject with me, or told me anything about his patent 1,402,309. I never discussed any piston subject with him. I didn't tell him anything about my piston that I conceived in 1906 and subsequently carried through the stages that I have stated, because Mr. Moore left the Excelsion Company in the latter part of the year, as I recall it, along about the holidays or just before. I never mentioned the piston, like Exhibit 51, to Mr. Moores. Mr. Moore did not see the piston that I put in the Amplex car in 1914, nor the piston that I put in the Renault car in 1911.

My experience in the automobile manufacturing business goes back quite a ways. I went with J. W. Packard on the 28th of Reptember, 1698. I was not entirely engaged in the automobile manufacturing or manufacture of automobile parts until I entered the employ of the Conn Company in 1915. I left the Packard Motor Car Company and was in Hillsdale, Michigan, in the manufacture of stationary gas engines until 1905, when I organized the Amplex Company in Mishawaka, and manufactured care until I left them in 1910; then I was with the Excelsior Motor Car Company until 1911.

From 1910 until 1915, to some extent I kept in touch with what was going on in the automobile industry, and in a good many other things. I attended the shows, and looked at the cars in the shows. Those cars very frequently showed a cross-section of one of the cylinders

to show the operation of the pistons.

I don't remember the Framier-Weidley car. I remember there was a Framier car, but I don't know what the Framier-Weidley was. I don't know whether or not it was built in Indianapolis; I am not sure; there was a Framier car, but I don't know where it was built. I can't recall now where it was built, it is so long ago. I might have seen that car around 1913 and 1914; I couldn't say positively. I have no recollection of seeing the piston that was used in that car.

I did not subscribe to any of the magazines, such as "Horseless Age" and "The Automobile" in the years 1913 and 1914. I looked at them, but I didn't subscribe

for them, in 1913 and 1914.

I heard of the Hershell-Spillman Company in Tenawands, New York, in 1915 or 1914. I understood they were manufacturing motors. I did not know what kind of piston they were putting out.

Beforeing to "Horseless Age" issue of April 8, 1914, I never new a cut of this Hershell-Spillman piston before,

I didn't know that they ever made one like that.

I don't remember seeing the "Horseless Age" issue of December 24, 1913, page 1091, and the cut of the Premier motor on that page, around 1913 or 1914. I never kept track of any of the patents on pistons that were insued in 1913 or 1914.

I never met Edward O. Spillman of that Hershell-Spillman Company; not that I recall. I never met Gustave E. Franquist, of Branswick, New Jersey; I don't

remember the name.

Referring to my original sketch and description, Exhibits 36 and 37, all of the people that I explained that sketch and description to are dead, with the exception of Mr. Offield, Mr. Pond, Mr. Tibbetts, and a man by the name of Smith. Mr. Smith's first name, I think, is Harry. I explained that aketch to Harry Smith in January, 1911. He was in the automotive business, selling automotive supplies, tires, etc. at that time. I explained it to Mr. Smith because he was a friend of the family. Luppose he is still alive: I don't know: I haven't seen him in a number of years. I am sure I explained it to Mr. Smith. There were a number of women that I explained it to outside of my wife; there was Smith's wife and Mrs. Grubb; but I doubt if they would understand it the way my wife did. They were not automobile drivers, not mechanically inclined; but they were to our house the night I explained it to Grubb and Smith. The whole group was there to dinner. The women listened in, but it probably didn't sink in very far. I explained it thoroughly to Mr. Offield and my wife, and also to Mr. Pond.

I don't think I ever explained it to Ira Wilson. He was in Pond's position before he became associated with Wilson; that is my recollection. My recollection is that I obtained the paper from the Amplex Company that I made Exhibits 36 and 37 on. I am sure of this became I brought a bunch of inferior band paper, when the Amplex Company was closed up in Chicago, with me, to use as aketch paper, and it was some of that paper it was made on. I haven't any idea where the Amplex Co. got it. It was no good for typewriter; it was no good for anything. It don't know what kind of paper that is, except that it is some sort of a bond. If don't know why the Amplex Company bought it: I presume they got stuck with it. They probably bought it cheap, and it was soft paper; it wouldn't carry a pen well, nor it didn't work well; it was considered inferior.

I am absolutely sure that the aketch and description, Exhibits 36 and 37, were made in 1911. I am positive it was made in 1911, in January. It was made at my residence in Chicago, not at a hotel in Chicago.

I said that the description, Exhibit 37, was incomplete because it was never finished. I could have added more to it; there wasn't much more to add to it, but I could have added more to it, and would have added more to it. I can't say offhand that I could have added to it

unless I read it over and see how much more, possibly,

I could have inserted in it.

(Witness examines description) It was possible to add paragraphs relating to the detailed construction, describing the effects relative to possible scoring, and minor other details which might be added in such paragraphs. Also it is incomplete because it lacks my signature. It lacked my signature because I felt I had more I could add to it in the way of descriptive matters, so I didn't put my signature onto it, even though I had it back a number of times. It was quite usual for me to date sketches in those days. Sometimes I didn't date them at all, but usually I did. That is the reason that I didn't date it, because I felt at the time that I wanted to add more to it, and that is the reason I didn't sign the description. I considered the drawing was effectively complete, but I didn't date the drawing. I have no explanation for not dating it other than I didn't sign and date the description.

In my direct testimony I referred to the dotted line in the middle view on Exhibit 36, and I gave as an explanation for it that I contemplated having the ribs extend only from one side of the wrist pin boss, one side of each wrist pin boss, but I don't recall that I said anything about that during the interference proceeding.

I would say the drawing and description, Exhibits 36 and 37, are sufficiently clear to show a mechanic what

it ought to be, give him the idea and principle.

In discussing the matter with my wife, I very likely told her that the webs were flexible; I explained it to her clearly. I don't know all that I told her, but I explained the construction of the piston thoroughly to her.

I presume there was something said about the flexibility of those webs, in the interference. I don't remember now offhand what was said in the amendments of September or November, 1922, in regards to flexibility of ribs. I can't say as to whether or not the flexibility was mentioned in my description.

(Description, Exhibit 37, handed witness.)

I think that question is covered in the first paragraph of Exhibit 37—"trelating to an engine piston which provides for and prevents seizing, binding or scoring when hot or oversize." If think that covers the cituation where the ribe are slightly flexible or in what portion of the piston the flexibility takes place. In Exhibits 36 and 37 there is no specific statement to that effect.

But, however, the explanation in the first paragraph and the last paragraph would lead any mechanical mind to believe that there must be a certain degree of flexibility there, inherent flexibility. There is a certain amount of flexibility where I provided a slot. The ribs would have to be extraordinarily thick to prevent any flexing.

in other words, with the pressures that are encountered when a piston operates in a cylinder, and with the expansion taking place, the ribs would have to be extraordinarily heavy in order to prevent closing of the elected strategic of the elected

ent in the aboutors : you on their away from it.

In Richibete 36 and 37/1 milled the picton an "congree picton," while in Richibet 22 the description, in may handwriting, in headed "consected type." That inscription was put on these around July 1914. I willed that a cross-load type picton because it has rike extending from the boson access to the skirt. At that time I diant tenow there was any picton made like that, but the cross-head type, or constand picton, has give might term it. I think at that time was practically make our plut what is my was also made heads are where the two heads cross-where the picton heads are where the two heads cross-where the picton heads are where the two heads.

Toronto and the comment of the comme

health trees

My 1911 picton was a cast from picton, and in that kind of a picton you don't have to warry so much about expersion of the shirtan you would in the abstract picton. I do not know of any cast from picton today that is split. I don't know that I ever saw a cast from picton that was split being marketed. I don't know that I ever saw any that was split, outside of the one that I made in 1911, but I do know that they gave an awful lot of trouble when they were not split.

I drive a Rachard automobile that has aluminum pistons. I have driven General Motors cars. I never owned a General Motors car, but I have driven a lot of their different models; I don't know what pistons they have got in now; perhaps they use nothing but cast iron pistons in all of their cars. I didn't own a Buick.

I considered it very desirable, in 1911, to split the skirt of a cast iron trank pister, for the very reason that the material that was in pisters at that the didn't as like the material by the Market the cylind like the short ti se after it wa in that were in the cylin der was entirely monthly of a charm might have five the local traces days. To have three fectlyose days. To were the entirely d

sakint from the hand by a slot helped very. slit lo far COULTE help it the full

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tinched together by p it is: there is a en boot tochip col always fa re L rot from the mark to the same the cover paper is as

cover might have been changed, and it might have been taken apart for photographing and put back together again. It looks to me as though it was the original thing.

In describing Exhibit 48 and how it was made and the motorcycle piston (referring to the 1911 piston), I stated that the reduced diameter of the head was carried down to the slot; overlapping the slot. I am positive that was done in 1911. I don't know whether I said anything about that in my interference before the Patent Office, or not; I don't remember.

I don't think I ever saw the Long patent that was in interference with my application at that time. (Examining Long patent 1,395/41.) On page 2, line 4, of this

patent, reading:

In a piston of this improved character it is preferable to have the solid end 1, of the piston of a leaser diameter across the peripheral surface adjacent the piston ring recesses 2, than the remaining lower portion of the piston, said diameter adjacent the solid end of the piston not being considered relative to this improved invention, as the usual type of piston rings mounted in the recesses will automatically take care of proper expanding, contracting and packing relation relative to said solid piston end,"

this does not read anything in connection with the relation—overlapping the slot; it says nothing about overlapping the slot. That is more clearance of the head down the length of the radius, same as on the standard Excelsion piston. That would stop at about the lower ring, and it would not be adjacent the lower ring groove at all. It would overlap the lower ring groove, but it would not run down to the slot that you have got in question.

I did not see any Long pistons at all during that interference proceeding.

(Recent.)

Mr. Brunings: In fairness to the witness, I would like to have Mr. McCoy state that the Exhibits 36 and 37 as now bound, are in a cover which was really furnished by me at the last pession. That is correct, Mr. McCoy, inn't it?

correct, Mr. McCoy, isn't it?

Mr. McCoy: That is correct. It is also correct that, to the best of my recollection, there was a brown cover on those papers when we first obtained them for use in this interference; but I

would not be sure about that, nor how it was bound. They were bound up: I know they were together, at

any rate.

Mr. Bruninga: I would also like to read into the record certain parts of the interference record. Page 42 of the record shows that Mr. Richey produced the sketch, then called Exhibit No. 1, and which is now Exhibit 36, as a separate paper. Page 45 shows that the description was introduced as a separate paper, as Exhibit No. 2, now Exhibit 37. The witness was, however, asked this question (p. 45): "Were the two of them ever attached together?" A. They were."

(Narrative continued) (Witness handed record) I testified as stated at page 45. The papers were attached together in a folder, and I didn't recall that they had ever been taken apart; I knew they were in a folder. My supposition was that was the original folder. They were not loose in the folder. They were pinned together; they were clipped together in some sort of a way, but I overlooked the fact they were ever taken apart; if they were taken apart in the interference, I have forgotten it. They passed through different hands in that form, clipped

together.

Q. That is what I mean, clipped together. Beferring to the Long patent, No. 1/489,499, page 1, line 80, reads as follows: "Insumed as the cut out portions provide resiliency to the body portion 2 of the piston, in order to take care of the greatest amount of expansion of the solid head of the piston, the periphery of the piston adjacent the solid head is made smaller in diameter than the remaining portion of the piston, as designated at 11, as the piston rings when mounted in the recesses 12 will provide the cylinder fit for the solid head 1, whereas the cut out portion 4 and tongue shaped portion 8 of the body portion 2 of the piston will yieldingly bear against the cylinder wall." Just for the purpose of identification,—in your 1911 piston you had that idea of reducing the skirt part below the last ring band and running into the top groove,—that was your idea? A. Yes, the head was reduced to overlap the groove.

Q. Well, the head and also the skirt part below the lowest ring line, if we can call that a skirt part? A.

The head constitutes all the rings:

Q. And also the part below the ring! A. It would . constitute the part down at the slot; that would constitoke the head.

I never found any relief necessary in either the Renault ezr piston or the Amplex car piston, that is, relief in the neighborhood of the wrist pin bosses; never put any relief on them. No relief was ever given the pistons, such as shown in Exhibit 51, in the region of the wrist pin besses. The expansion of the head would exry the skirt in the region of the wrist pin bosses with it so as to press against the sylinder and cause a wedging action, to some slight extent, yet not enough to be of any serious consequence. We never found any trouble with it in that respect.

Q. There is no necessity in a piston of this kind like Exhibit 51, to have relief offset in the region of wrist

pin bosees?

Mr. Richey: I object to that as calling for a conclusion of the witness. He is a fact witness and he is asking all kinds of opinion questions. He certainly makes the witness his own, going outside the direct.

The Master: I think he may answer. He is the inventor. He can give his opinion for what it is worth. Same rating. Objection will be overruled.

(Narrative continued) There was no consion for putting rules on the pistons because they were tested out and they worked all right. That piston was estinfactory as far as eating and scoting was concerned. That piston probably wouldn't have some.

We had no trouble in a piston like Exhibit 48, with the sharp comers splitting off, nor did we have any trouble with the piston like Exhibit 51. I tild not find any

trouble with the girlen like Strinbst & . I that not more any of the split off after three thousand miles, in using Exhibit 48. I found no corners split off in a piston like

Exhibit 51, in 1914.

I ran that Rensult car, with pistons like Exhibit 48 in it, at sixty miles an hour, over ordinary gravel, stone and concrete roads. They had tarvia roads, stone roads; sort of the same concrete through to Michigan City by way of Valparaiso, and hard gravel roads; they were all good roads; not all concrete. Racing speed in those days was higher than that. There were lots of cars that could make sixty miles if they had everything in their favor. I drove at mixty miles an hour for only short distances. You couldn't ride those roads continuously; that is, with machines. You might get up to sixty miles

an hour for half a mile, maybe a mile.

The Western Foundry Company, of East Bridgeport, I believe, was the Manufacturers Foundry at Bridgeport: Manufacturers Foundry in the East, is where some of the pistons were made. It was East Bridgeport or in that neighborhood somewhere, between some of those eastern cities.

The photograph, Exhibit 60, doesn't show the piston;

you couldn't very will see it. Harvey Wilson, who was with me on that trip, never saw that pisten. I explained it to him as therough as I could, so that he understood the idea. He was an automotive expert in the employ of the

company at that time, or had been.

The 1911 Remailt our piston possibly had two tapped holes in the wrist pin bosses, but only had one set screw in the pin. I don't know whether or not this piston was

of semi-steel; they were supposed to be; the semi-steel in those days was sort of a cast job. Referring now to the Amplex pisten of 1914, of which Exhibit 51 is a shotch, the only alterations I made to the core box was the putting in of those two little ribs extending from the hors up to the top, There was no change made in the thickness of the skirt at all. It was an extra heavy piston to start with; it was not designed to fit that meter; it was sort of what you might call a bastard' size pastes. The pattern for this piston could not have been used for the piston of my sketch. Exhibits 36 and 37, and the blueprint, Exhibit 32, unless it was built all over. Nor could it be used for the catalde. It wasn't proportioned; it wasn't designed to fit that motor; and could only have been used if properly designed by building it all over, both patterns and core boxes. We didn't have to change it to make the piston corresponding with Exhibit 51. All we did was put the ribs in the core box, and left the walls to whatever thickness they came. If I had wanted to make the piston with the ribs running crosswise with the bosses to the skirt, then it would have required new core box and new pattern. No, you probably could not use the same core box and pattern—there probably would have been too much metal on the core box itself; males you made a new core box it wouldn't have the proper dimensions. You would have to redesign the whole job, rebuild the whole job. I am absolutely sure that the 1914 Amplex piston was slotted all the way around at the top. Even though some of the other witnesses say it was not, I still say it was slotted all the way around the top the same as that;

it absolutely was.

That slot was cut in a lathe when it was turned, not with a saw. The tool room that turned out the pistons cut that alot in there. I don't know the man's name who cut the slot, nor the man's name that did the machining. I know who the foreman was in the tool room, but I don't know who did the machining. Mr. Winchester was there at that time.

Mr. Richey: I object to counsel testifying.
Mr. Brunings: Do you deny Mr. Winchester
said that?

Mr. Richey: I don't know whether he did or not. I object to it.

The Master: He may answer.

(Narrative continued) I don't know what Mr. Winchester said, but I know it was alotted all the way around. Mr. Winchester was in the drafting room; he had practically nothing to do with the machine shop. I don't know where he would get his idea that they were not alotted all the way around. Mr. Winchester was not put on the job of designing that piston. Mr. Winchester designed Exhibit 32, but he was in the drafting room; he wasn't spending his time in the machine shop, so consequently he didn't know what was going on in the machine shop or the erecting room; so I don't know how he could say this pistomus it was used in that car wasn't alotted all the way around, unless he got the wrong imprecision.

Mr. Winchester might have wandered into the maohine shop, but his business was to stay in the drafting room and design all their stuff; he had no business in the

shop.

There was no reliefs in the region of the wrist pinbesses in Exhibit 51; it worked all right without it. There were more than seven castings made. The first run of castings were spongy and full of blow-holes, and those were thrown out. There were seven castings made, an extra one made because we didn't know but what one might be spoiled in machining. We wanted one extra, and one was broken; one was broken in some form in the assembly.

The piston like Exhibit 51 was a sand cast piston. I wouldn't say that it was absolutely perfect as far as

blow holes and pin holes, etc. are concerned. There were minor pin holes in it, but not enough to do it any par-

ticular damage.

As to the mileage the car, with pistons in it like Exhibit 51, was run with those pistons in it, I can't tell from Exhibit 28 how many miles the car was run with the aluminum pistons in, but it was run 816 miles with the iron pistons in the Buda motor. That was the speedometer record. The back of the exhibit shows 6,112 miles. That was when the car was turned over to Cook, and it was sold; it had approximately 6,112 miles on it. There is 816 miles off of it, would leave the net mileage that the car was driven with aluminum pistons in it, about 5300 miles, between July to November of 1914; it would be in that neighborhood. It was driven very little after it was changed. It might have been driven a hundred miles after the pistons were changed. It was driven spproximately 5000 miles with those aluminum pistons like Exhibit 51 in evidence, from July to November 1914.

I don't know who put the notations in red ink on the front of that Exhibit 28. I was under the impression that Randall did, but I think—and I am not quite positive it wasn't Randall—I think it was Randall's assist-

ant, the day I received the bill of sale.

I den't know that I asked Randall to put the mileage on that. The bill of sale was ready for me: I went in the office and got it along late in the afternoon, and I give Randall's assistant-I am quite positive he was the one that put it on the mileage, and also had him make a notation of the type of pistons that was in the car on this bill of sale. I made this notation on the back myself. I saw the notations put on the front of that bill of sale; I gave him the information and he put it on there in my presence, and I took the bill of sale. I was under the impression it was Randall, at first, but I don't think that way now; I am quite sure it was his assistant. Randall told me himself he didn't put it on. Quite some time ago I asked him about it; I saw Randall in Milwankee one day, and I was talking with him about it, and Randall said he didn't remember putting it on. A man by the name of Parlow, his assistant, was the one that put it on he figured put it on, so I wa quite sure Parlow is the man that put it on. I sake Randall about this. It came up over this man Jernegar on here. The car was sold to make it clear and I had to take this bill of sale to this attorney Jernegar to see if he couldn't collect

the money from the man that sold the car. He didn't get any, so I had to go after him to get this money. That

is what brought up this question.

I put that notation on the back right shortly after this man Cook got the car. Cook had received the car; he had it about a day and I found out I couldn't get my money out of this man who sold it to him, so I went to the car, get the mileage and made this notation and took it to Jernegar. Jernegar was an attorney in Mishawaka.

I received that bill of sale on the day that the pistons were completed in the car, late in the afternoon; the pistons and the top were both completed the same day. The order was given for the car four or five weeks prior; the car was in my possession; I was driving it without a top; that is how the 816 miles got on there. But I wouldn't accept the bill of sale until the car was complete, and the bill of sale couldn't be made out until the top was on the car. The Buda pistons were in that car up to that mileage, 816. I had bought the car before that. It was turned over to me and I had driven it nearly four weeks prior to that, but I hadn't accepted the bill of sale until I get the top on it; they couldn't make out the bill of sale as a complete car, specified complete, because there was no top on it.

The man who made that metation on the front of the bill of sale was on office man; I don't suppose he ever saw the car. Naturally, he wouldn't be out in the factory to know about saich things, and I told him what was in the car. II know they were going in the car because of the fact castings were billed in with a lot of other aluminum coatings, and they were charged up to me, and that charge had already been made some week or ten days prior to this date, while the castings were

being machined up.

Mr. Bruninga: I object to that part in which the witness said he know they were going to be put in that car, and move it be stricken out.

The Master: Same ruling.

(Narrative continued) I don't suppose the man, when he made that notation on that bill, absolutely knew that those pistons like Exhibit 51 were in that car; probably never saw them.

I paid the Amplex Company for those pistons myself. When the pistons came in they were billed to me and they were charged to my account. They owed me about \$900 and they were charged off. They were paid for possibly ten days prior to the receipt of this bill of sale. I have no record of it now.

Referring now to the blueprint, Exhibit 32, which is the detail of the piston, and bineprint, Exhibit 31, which is the crops section, I gave Mr. Winchester the fletches, Exhibits 36 and 37, the original sketch and description. I observed the making of those drawings and tracings practically every day; I was in the drafting room every day that I was in the city. I don't know as I stood over the draftsmen and saw then put the vertically extending slot, the inclined slot, on the drawing. I know that Winchester laid out the piston, and he put the inclined slot in, and he did the whole thing according to my directions and my explanation and the explanation of the sketches; but when he got the layout down on paper it was traced in by the tracing boy, whoever he was, and that's the way it was finished. But I saw the procedure as it went along. It wasn't necessary for me to stand over Mr. Winchester, inasmuch as he was a practical engineer. I did not see Mr. Winchester put in that inclined slot with his hands, nor did I see Mr. Rockhoff do it : I don't recall that I was standing over him when he put it in. I saw the original drawings after they were finished, and both drawings positively had the inclined elot on there. II won't say about the first one, Hishibit 31; I don't just exactly recall; but if it is in there that is the way the original drawing was made, or they couldn't have made a tracing or print from it.

I am absolutely positive that drawing, Ethibit 32,

had that inclined elet.

I am also positive about drawing, Exhibit 31, that it shows the piston and describes this piston, but whether the section exactly shows how the slot was in or not, I couldn't say. It might have been out through a section where it interfered with the slot; but it is the same piston in 31 as in 32.

(Witness examines Ethibit 31.) No, it does not show in 31, and the way it is cut here and the way it is sectioned in, it does not show it, because it would come on the side. In order to show it he would have to cut it off and actioned it in different. If suppose that is merely an error in the tracing. It is an error in the tracing, or it would show there, because it is the same distance there and the same distance here. Exhibit 31 should

show a portion of the slot. A half of it would show in Exhibit 31 and the other half wouldn't, no matter which way it would be taken. A half of it would show in there.

unless there was an error made in that tracing.

I don't think I made any statement to the effect that Exhibits 31 and 32—the original blue prints—were never out of my possession. There were two blue prints made of Exhibit 32. One blue print that had the description on, that you have there now, was used when we were selling stock, to show our prospective customers what we were trying to build in connection with this engine. The other blue print wasn't marked up, didn't have a description written on it, and I don't know what became of that one. There were two of the prints originally.

The blue print of Exhibit 32, the original they have there was out of my possession at different times. It was in the hands of a party that was trying to sell stock for us. I think Mr. Pulsifer used it for a while, and I think Mr. Atkins used it for a while, and they were also using a section of this engine later on, and they also used those other prints, those of the engine. That's why those views were made first, to give a general idea to a prospect of what we were going to build. Those are the people that had those prints while they were out of my possession, and they came right back into my possession.

I turned Exhibits 31 and 32 over to Mr. Tibbetts

personally.

The Patent Office drawings marked A4 and A5, respectively, (having reference to the slide valve motor), referred to in Mr. Tibbetts' letter of March 27, 1916 (Exhibit 52). I presume, very likely refer to the Patent Office applications of the sleeve valve motor, but I don't know just what they refer to. I think Mr. Tibbetts must have been referring to the application on the sleeve valve motor filed by Mr. Pond or Mr. Offield, and this was a photostat of that application. I believe that is what that was, that sleeve valve motor. I think that is what A4 and A5 refer to. I don't know positive, but I believe that is what it refers to. That is my recollection.

I believe the Packard Company were using iron pistons at the time of our negotiations. I had one of their twin sixes at that time, and I know it had gray iron pistons in it. The pistons were not slotted; just plain pistons. I believe the Packard Company were using iron pistons in November 1917, when these negotiations

were closed up, because that is what was in my car, and the ones in my car were not slotted. Those pistons made considerable of a racket; nothing like the big pistons. Pistons down to three and three and a half inches will run a whole lot smoother and quieter than with the five inch. The trouble in the earlier days was with the big pistons.

Q. In Interference No. 49,569, as found in the record on page 2, in reference to a somewhat broader claim in that interference, you made a preliminary statement under oath on the 23d day of August, 1923, that you had conceived the invention on the 25th day of August, 1911; that you first made drawings, which included sketchesunless you understood it to the contrary on that same day, 25th day of August, 1911, and that on the 25th day of August, 1911, you first made a written description, and that on the 25th day of August, 1911, you first explained the subject matter to others, and that the first reduction to practice—that you first embodied the invention in full size engine which was completed about the 25th day of August, 1911, and successfully operated. Can you tell me how you arrived at those dates at that time! A. No, I don't understand that at all, because I couldn't have driven it at the Elgin races in July, 1911, and did that in August, 1911-unless that is an error there somewhere.

Q. That is the way the preliminary statement reads. That preliminary statement was made after an investigation by you and patent counsel of what you had done on these pistons, isn't that right? A. Well, I can't explain that. I drove the car in July, 1911, with the pistons in it. So I couldn't have put the experimental pistons in

in August.

Q. Well, I can understand that, Mr. Gulick, and I can understand why you now take the position that is not a correct date; but you signed such a statement on the 23rd day of August, 1923, which was almost a year after the time that you made that affidavit on November 8, 1922, in Cleveland. Can you tell me whether there was any conference between you and anybody in Cleveland, or anybody that held little to this Gulick application at that time? A. No conference that I remember.

(Narrative combinued) There were quite a number of preliminary statements signed on that day, but I don't know whether or not they were simply sent to me for signature. The notary public was John M. Eagle, in

Elkhart. I signed those in Elkhart; they must have been mailed to me from somewhere, but I don't know where.

I had been involved in interferences before. I know what the thing was about when I was asked to sign, when I conceived and when I disclosed the invention, but I don't understand the dates there in Angust 1911. That must be an error there somewhere, a misprint, because no such date as that could be in August, 1911, covering that condition or statement; that was the first of disclosures.

Q. It is no misprint, Mr. Guliek, at all; it is the record of the proceedings in the Patent Office, and that is an actual record of your preliminary statement before the Patent Office (handing to witness). A. Yes, I see. Let me read it and see what it says.

(Witness reads pages 2 and 3 of the record in Interference No. 49,589):

Edward J. Guliek, of Elkhart, Courty of Elkhart, State of Indiana, being daly sworn, deposes and anys he is a party to the above entitled interference, declared by Commissioner of Patents, July 7 1923, and that he conceived the invention set forth in the declaration of interference on or about the 25th day of August, 1911; that on or about the 25th day of August, 1911, he first made drawings of the invention; that on or about the 25th day of August 1911, he made the first written description of the invention; that on a about the 25th day of August 1911, he first explained the invention to others; that he first embodied has assession in full use engine which was completed about the 25th day of August, 1911, and that on the said 25th day of August, 1911; the said engine was first successfully operated in the city of Chicago, county of Cook, state of Illinois, and that thereafter he continued to use same and product/hand successfully used one or more additional engines embodying said invention.

(Marrative continued) Well, that is an ervor there somewhere in August; it is an ervor of one month. The record shows that I signed the outh, but I don't know how that could have happened, because there is just one month lapse, difference, in error.

Q. The conception date should really be in 19061. A. The conception date is the—I used them in the Excellior motor—should be 1908. Well, that is referring to this one—51—32—

Mr. Richey: There is some explanation of that on page 43 of the record, where notice was given and application was made to amund the preliminary statement. Such that single section

Mr. Brunings: Yes, I understand that, Mr. Bickey; I understand application was later on made, and that he corrected himself during the course of the interference proceedings, but what I would like to know is how somebody arrived at that date of August 25th.

Mr. McCoy: There was no application made to amend that preliminary statement, to my knowledge. I think that was allowed to stand. The preliminary statement was in the nature of a pleading. I think that was allowed to stand, because there was no necounty of clearing up back of 1911. The Patent Office ruled the owner of the patent was entitled to rely on a date when the date set up in the preliminary statement would not entitle him to go back of that.

(Narrative continued) I can't explain how the date

(Narrative continued) I can't explain how the date of the 25th of August, 1911, was arrived at III should have been July. The date of August 25, 1911, was no critical date at all at that time on the piston need in the Excellion motor. There were no pistons involved on August 25, 1911. No statements to that effect.

I binist i understand the claim in interference 49,570, reading: "A piston comprising a head and body internal yielding ribs supporting the head and body and means on said ribs adapted to form engaging connection with the operable parts for said piston." Andraico my preliminary statement, reading on page 9 of the record: "Edward J Chilist, of Mithart, county of Elkhart, state of Indiana, being duly overn, deposes and says he is a party to the above entitled interference, declared by the Commissioner of Patents July 7, 1923; that he conceived the invention set forth in the declaration of interference on or about the 25th day of August, 1911; and that on or about the 25th day of August, 1911; he first that on or about the 26th day of Angust 1911, he first made drawings of the flavouring; that on or about the 25th day of Angust 1911, he ment that day of Angust 1911, he mede flavourism description of the invention; that on or about the 90th day of June, 1914, he first applicable fivention to others; that he has not reduced the invention to pencioe other than by filling of his application. Serial Mo. 204/681 involved in the interference ? That statement also was executed on the 22d day of August, 1923, before John M. Esgle, Notary Public, Elkhart, Indiana.

O. I believe you understand that particular claim relates to the vielding ribs or web structure, and does not contemplate Exhibit 48 and Exhibit 51 which had no yielding webs. So according to your testimony, you. say that you were entirely correct in stating that it had not been reduced to practice, that is, an actual piston made and tested prior to the filing of the application? A. That is, speaking of Exhibit 32.

O. Yes, Exhibit 32. The preliminary statement says over your signature and under oath that you first explained that invention to others on the 20th day of June. 1914, which would correspond to the date of four days prior to Exhibit 32 A. That is with reference to 32 here. Now there may be a mixup in the dates somewhere.

I might have got the dates wrong.

Q. You are still sure that you explained the Exhibits 86 and 37, the original sketch and description, to other people before you showed it to Mr. Winchester?

A. Yes.

Q. But can you explain how it happens that you stated in your affidavit in 1923, that the first time you ex-plained that thing to others was on the 20th day of June, 1914, which would correspond with the date Mr. Winches-ter said? A. I can't explain that date of the 20th day of June, because it is not logical to believe a man would take and make that on the 20th day of June until this date eight here—he would make it from the 20th to the 24th. So it was explained to Winchester very much prior to that date, and how that date got mixed in that way. I don't know, unless I mixed up the dates in my statement, because Mr. Winchester had that information long prior to that date of June 1914.

Q. Will, you didn't sign these two affidavits, these preliminary statements, without knowing what you were signing, did you? A. Well, I might have get mixed up

in the dates there when I signed them.

Q. Yes, but every date is mixed up, isn't it? A. No.

not every date.

Q. There is no August 25th date that is critical at all, is there? A. There is no August 25th date critical

in which I put pistons in the Excelsior motors.

Q. There is no 20th day of June, 1914, that is critical? A. Well, the 20th day of June date does not correspond with this; but this is correct, and they were in Winchester's hands long prior to this date here of June 24th. But I can't explain how those vistes got in there, unless that was an error on my part when I signed those

offidevits.

Q. I wish you would refer to pages 43 and 44 of the Gulick record before the Patent Office, Interference Nos. 49,569-570-571, particularly to answer to Question 30, in which you state with reference to a pisten: "Q. 20. which you state with reference to a piston: ""
Have you may other way of fixing the date of the mo
of Exhibit I than you have named? A. Nome other cept that we made a set of these pisters for a motory motor, which was block-tested, to be used in a rec motor prior to the official spening. Further, the piste used in this test were of the standard racing type were to develop the split skirt idea, but were not rib exactly as shown in this should. Rightfill correspond to Exhibit 36. When you used the words "not rib exactly as shown in the should be words "not rib exactly as shown in this shotch," you really me were not ribbed at all, that the motorcycle pists ribbed at all? A. It wasn't ribbed from the be

Q. It was just those little circumferential ribs? A.

Circumferential ribe.

Referring to the block test of that motorcycle pisten, further along on page 44, where I said: "And so the standard piston for this purpose was not ribbed according to the sketch but the skirt was split, weakened them and they were not put in the races." One of the pistons did fail; one of them bursted through the piston pin hole; but it didn't fail as far as seizing is concerned, or scoring.

mg.

In my snewer to Q. 131, page 60, I said that I came into presention of the print, Exhibit 9 (which corresponds with Exhibit 32) shortly after it was made, that is in July 1914; while on the sext page, in my answer to Q. 136, I stated that I received it in June, 1914. June 1914 is the correct date. I gather that from the date on that drawing, and that date there is correct. If fix it by the date on the drawing and not from my own recollec-tion; I couldn't remember the date; but that is correct, that is when it came out, the print was made, and that is that is when it came out, the print was the print was that is when it came out, the print was the way I have of made from the tracing. That is the only way I have of fixing that date, and those dates I know are correct; the dates on the tracing are correct.

Exhibit 32, with the de-

I didn't disclose the print, Exhibit 32, with the descriptive matter on it, to anybody at Harvey, Himeis. I mailed the Buda Motor Company, of Hervey, Illineis, a print and their engineering department had it, and I don't know who all saw it, who went over it, and I don't

with the pinton pin means rigid structure of a web running across the top of the pinton from been to been as a good many pintons have been made of solid struc-ture. That is what that refers to.

3

Q. You didn't say anything about flexibility of web to Mr. Tibbetta did you! A. I don't know what I did

say to him.

On page \$1 of the record I testified as follows: "XQ. 261. In your suswer to XQ. 13 you have stated that in addition to showing and exhibiting Exhibit No. 1, to your wife, you also disclosed it to one or two other parties. Do you now recall who the other parties were? A. They were friends of mino who lived in the immediate neighborhood. XQ. 962. Our you give their names? A I can give their names, but it don't some to be warranted the idea in two of them were women. XQ. 962. That the idea is two of them were women.

Were their annual? A. (Decree Mrs. Smith and the Mrs. Grabba. Their hashands also visited my be numbrone consisted and have of it, but not sell to be able to testify. Q. Two of them.—or both of A. Yee, Q. Did you disclose Exhibit No. 1 to 1 salso visited my house on moor both of them? at A I believe Little

I did show Exhibit 36 to Mr. Smith and also to Mr. Grabb, and I explained it to them. I don't knew whether they understood it or not, but I tried to make them under-

By the statement; "The harbonds also visited my as a superior end know of it, but not enfountly familiar with it to be able to testify," they stated my home and now the west I was doing, and I whitely very much after one of them would be able to diff, or to the details. While they would have of the house on a The state of the s a split new. Th a split best shaded understand what the func and 37 was

Q They dikn't understand the web construction,

Mr. Richey: I object to these questions, what semibody also miderated. He can testify what he did and tell them about it.

The Master: Proceed with the examination.

Answer the question.
The Witness: My impression is they under-

(Narrative continued) By the statement on page 81, "but not sufficiently familiar with it to be able to testify." I meant that I believed they understood it was a split skirt piston; but the actual details of the functions of the ribs and various other things. I don't believe they understood and would be able to explain it, and probably if they were to testify all they could say it was a split skirt piston, and what they understood it was supposed to do, and I thought they wouldn't be able to testify.

On page 86, I testified in 1926, in answer to XQ. 253: "In showing it to my wife she was the only one that was familiar, by my explanation, with its construction. The other parties mentioned, being neighbors, eaw it, as previously stated, but they were not qualified to understand it. For that reason, in my first answer, I didn't mention them. I had forgotten the circumstances."

My wife thoroughly understood it, and I don't think they, the neighbors, thoroughly understood it, the details; in fact, I know they didn't understand the details. but they did understand it was a split skirt piston. That's the only point I am trying to make. In those answers I was referring not particularly to the women, because I know they would not understand it too well. Probably understood the words "oplit skirt piston." But the men would understand more what the functions were to be, but not the details.

(Thereupon an adjournment was taken until Thursday, March 16, 1933, at 9:30 o'clock a. m., hereupon the following proceedings were had:)

Mr. Richey: Before we proceed with the witness I understand he would like to make an explanation of this Watts & Gehr matter and also in connection with those dates in the affidavit. Is that satisfactory to you!

The Master: All right, proceed.

The Witness: The dates stated in the preliminary statements in the interferences were not clear. to me, and I didn't quite understand how the d'es got mixed up the way they were, and not being sure whether it was Mr. Watts or who it was who sent the affidavits in, and I inquired of Mr. McCoy as to who had the case prior to his taking it over, and I learned it was Mr. Gehr. So when I naked Mr. Mo-Coy what became of the correspondence of Gehr, not having any myself I had nothing to refer to, and he

told me the correspondence regarding these affidavits or preliminary statements had been turned over to

him; he gave it to me and here it is.

Mr. Bruninga: (After examining correspondence) It seems to me the proper thing is for counsel to examine him on this matter rather than let him go, what I might say, rather wild on hearsay statements.

The Master: Of course if he wants to make a statement he may make it and you can examine him about the statement if you care to.

Mr. Bruninga: I have no objection to this witness clarifying the issue, but it is only this danger

of getting so much hearsay into the case.

The Master: I think he can make a statement to correct his testimony if he wishes; if he gets off into

hearsay, we will stop him.

Mr. Brunings: There is one thing I would like to ask right now, because it might be included in his statement, and that is the letter of August 22, 1923, of Mr. Gehr, calls aftention to the fact that there was a history dictated by this attness while he was in Cleveland, and I think even in fairness to the witness he ought to see that history because it will be produced some time.

Mr. McCoy: May it please your Honor, we are making search for that history at the present time, and because of the great volume of papers in this mass of material that accumulated during the interference proceedings and so forth, we have been unable to locate that history as yet. I have also phoned Mr. Gehr to look in his files for that history, and we

will hear from him.

The Witness: Gehr's letters show that he secured his dates from New York as to the time of the Elgin races, and when the affidavits were sent to me they read "on or about," and I took it for granted that "on or about" gave me quite a range of latitude as far as the date was concerned, and the time being very short in which the affidavit had to be gotten to Washington, only four or five days or whatever it might have been, I, without further question, believing he was correct, signed the affidavits and forwarded them on. And Mr. Gehr's letter covers the whole situation, and my letter to him in which I believe I said there they are as nearly correct as pos-

sible, something to that effect. I believe that about covers the situation about why the dates in these affidavits were given as they were. That is all.

CROSS EXAMENATION CONTINUED by Mr. Brunings.

I have read this letter of Mr. Gekr's. I don't have the original. That was not one of the letters that was burned up, not at that time, but I haven't a copy of that letter and I don't know where it is; I haven't the original

of that letter, I don't know what became of it.

That letter starts out: "In accordance with my telephone conversation with you this afternoon, I am enclosing herewith preliminary statement." Mr. Gehr
must have phoned fine, but I don't recall what he phoned
me about. I recall the letter. I don't remember what
he asked me over the phone. I don't remember what he
asked and I don't know positively that he phoned me, I
couldn't swear that he did; evidently he did.

This letter also proceeds "the claims in issue are broad unough to read on the fistens which you actually constructed in 1911 and again in 1914." If had told Mr. Gehr about the 1911 and 1914 pistons, but I don't remember of ever giving him a sketch of it like Exhibit 48. I gave him this sketch, Exhibit 62, this was made in his office. I don't recollect of giving him any other sketches, but I might have. It imagine Mr. Gehr would know.

Mr. Gehr was the gentleman who wrote me the letter and the one that I conducted the conference with. He was the only one that I know of. I was under the impression first that Watts was the man, but because I was mixed up between the throe, between Richey, Slough & Watts, and Mr. Gehr, because Mr. Bibbey having taken the interference testimony and having been here and been in Mr. Gehr's effice, I don't know what the connection was so in remembering the names I had the name of Watts in my mind when I meant Gehr. I didn't go to see Mr. Watts to see if I would recognize him as being one of the parties.

Mr. Bichey: I think he is mistaken about that. Mr. Watts was in our office yesterday afternoon when you were there.

The Witness: I don't know if I met him. If I

did I didn't recognize him.

(Narrative continued) I don't know who he was if I did meet him.

I have not seen Mr. Gehr since I have been here in Cleveland.

Since Mr. Gehr said in his letter that "the latter form of construction is shown in sketch marked B-1 and which is attached to the history you dictated here in Cleveland." I must have dictated a history, but I had forgotten all about it. I den't remember now if the history was taken, what it contained, if such was dictated, or what it we

I don't remember what sketch Mr. Gehr is referring to where he says in his letter: "This sketch, I underto where he says in his letter: "This sketch, I understand, you made some time while you were with the Excelsior Company in Chicago, prior to the Elgin races in 1911, to which you drove the car just then fitted with the shit and split pistons."

(Referring to the letter B-1, marked Exhibit 36.)

Evidently Mr. Gehr had B-1 in his possession at that time, and this inquiry referred to the sketch B-1 which was made prior to the Elgin races.

I read that part of Mr. Gehr's letter which reads: "I have maned on or about August 25, 1911," as the date for your conception and the drawings (aketch B-1), d fon or about June 20, 1914, as the date and I man which you disclosed the invention to others. I placed this latter date June 20, 1914, arbitrarily just a few days before June 24, 1914, the date which appears on the drawings made for you at Mithewala. Boubtless you disclosed this subject matter to the draftsman a few days before he completed and dated the drawing."

In the last paragraph of Mr. Gekris letter, where he

states: "I think I have fixed the dates as accurately as it is possible to do it, but if you find anything seriously wrong, I suggest you telephone me at once upon receipt of this statement. I shall be in Cleveland tomorrow. Thursday, but will be in Detroit all day Friday, and you can reach me there by calling the Arctic Ice Cream Company." I did not phone Mr. Gehr, that I know of; I don't think I did phone him.

Q. But you let that matter stand that you had not disclosed the subject matter of B.I. or sketch B.I. to anyone prior to June 20, 1914, you left that stand in the preliminary statements, although Mr. Gehr particularly called your attention to the fact that he took that to be the date that you must have disclosed that to the drafts-man. A. Well, that was the first setting of the date. It was disclosed to the draftsman in 1914 prior to that

date, and that is according to his letter, he didn't know just when I did disclose it, I don't suppose. In his letter there, referring to "on or about," I didn't consider but what there was a range of latitude there that would take any date; it wasn't positively fixed; it may have been one month or two months or three months back.

Q. Did you consider a statement of disclosure of the flexible web construction to others as of June 20, 1914, to be verbally flexible enough to cover 1911! A. I

wouldn't say as to such disclosures.

(Narrative continued) In my letter of August 23, 1923, I said: "I am in receipt of your communication and instruction of August 22 covering the interference piston application Serial No. 204,661. Insofar as I can see, they are as correct as could be expected under the circumstances." At that time I felt Mr. Gehr knew what he was doing, what he was talking about; he looked up the dates and I hadn't.

I never had been in an interference before that time, not before the interference in this case, to my knowledge.

Q. Now, think back. You were in the interference of Huff vs. Gulick? A. Oh, I beg pardon, I was in that interference.

There are no others that I know of, that I can recall. I knew what the purposes of preliminary statements were. I didn't look up the dates on which I was going to rely; I left that to Mr. Gehr. He had the whole matter in hand. I didn't own the patent; that was of no interest to me, if he wanted to establish the dates that way, as long as they were within the range of what I knew was correct, within a reasonable range, I had no objection to signing the affidavits.

If the reasonable range made a difference of three years I would naturally give it some thought, but when it was within a year, and he said "on or about" I didn't make any objection, I don't know what the date was.

Q. But when the preliminary statement specifically set out you disclosed the subject matter of Exhibit B-1, that is Exhibit 36, in 1914, and you actually, as you say now, disclosed it to others as early as 1911, there is quite a discrepancy, isn't there?

Mr. Bruninga: Interference No. 49,570. It states on page 9 of the Gulick record in the interference that "on or about the 20th of June, 1914, he first ex-

plained the invention to others."

Mr. Richey: Well, he referred to B 1. There is not any reference to B-1 in there, is there?

Mr. Bruninga: Well, Mr. Richey, you will hardly disagree with me, by looking at the amendment on the opposite side, that that refers to B-1.

Mr. Richey: I want the question to be clear to the witness, it is not what I understand, but what

he understands.

Mr. Bruninga: That was all settled yesterday

what it related to.

Mr. Richey: If he understood the question it is all right. I want to be certain about that.

(Narrative continued) I take it, by reading Mr. Gehr's letter new, and by reading the claim in Interference 49,570, on page 8 of the Gulick record, and by reading the preliminary statement on page 9 of that record, that that statement in the preliminary statement in interference 49,570 "that on or about the 20th day of June, 1914, he first explained the invention to others" refers to Exhibit 36. However, the dates that he stated in here, I don't know how he arrived at them, I can't undertsand how he arrived at this date of June 20, 1914.

Q. Well, read his letter to refresh your memory on it. You read that letter at that time.

The Master: The question is what you had ref-

erence to in your statement?

The Witness: Mr. Gehr says he placed this disclosure arbitrarily. I take it for granted he knew what he was talking about and signed the affidavit accordingly. He was referring to the disclosure of Exhibit 36, as I take it.

(Narrative continued) I presume very likely I told Mr. Gehr that Exhibit 36 had been disclosed to others in 1911, because he had 36 in his possession. I didn't try to correct him on this letter, I didn't write him any letter. I took it he was an attorney and knew what it was about. My letter to him was not to the effect it was all right; I told him as far as I could see it was as correct as could be expected under the circumstances. He was looking up the dates, I had no record of the absolute dates. So I followed his instructions and advice in the matter. He was the attorney for the patent; I had nothing to do with it. It was my idea at that time that the dates were as correct as they could be made under

the circumstances, because as he said "on or about" there was latitude to work in a

I made the statement on page 48 of the Gulick record: "The Exhibits 1 and 2 (Exhibits 36 and 37 in this case) were made prior to the Excelsion plant being turned over to Mr. Schwind, the purchaser, in November, 1911."

On page 62 of that Gulick record, I testified as follows: "Q.143. Have you been able to think of anything else by which you can identify the time when Exhibit 1 was made by you? A. Yes. Q.144. Will you state it? A. In making up this sketch, it was the first time that I gave any personal attention to the mechanical features of the motorcycle motor, and as the development of these motors for racing purposes was going on, in sketching up Exhibit 1, I had in mind the general form of the motorcycle piston, and pictured the sketch about the same as the piston used in the motorcycle, that is, as to shape and dimensions. I never did any other work on a motorcycle except to follow it through until the time it was tested, which was some time prior to July 1911."

On page 57 of the record, I testified as follows: "Q. 105. Will you explain why you slitted the pistons like Exhibit 8 and used them instead of making them up like shown in Exhibit 1, in 19111 A. Excelsior Motor Manufacturing Company at that time was in the hands of a creditors' summittee for a receivership, and I had instructions from the chairman of the committee to make no expenditures on experimental work for automobile motors, as it was the intention to discontinue the manufacture of automobile motors in event of the receivership being dismissed. Therefore I couldn't make up any special construction. Q.106. Was the Excelsion plant sold, and if so, when, and to whom? A. The Excelsion plant was sold to a man by the name of Schwind of Chicago, about the lat of November, 1911, and I turned over the keys to him November the 11th, 1911. Q. 107. When did you leave the employ of the Excelsior Company! A. About one week following the turning over of the keys to Mr. Schwind. Q. 108. Will you give your reasons for putting the standard pistons back into the car after the removal of Eighibit 8 pistons? A. One of the reasons was that it was not a standard piston and could not be sold as such to any Excelsior Motor Company's enstomers; another was in order that all motors were to be disposed of, and no others were to be manufactured by the Excelsior Company; further, as I, as the inventor of

the idea, I considered it was of value, and as it was designed on my own time, it was my desire to hold it, and, further, I did not know what Mr. Schwind's attitude might be in connection with the motor end of the industry."

Mr. Bruninga: Exhibit 8 corresponds to Exhibit 48.

(Narrative continued) On page 65 of the record, I testified as follows: "Q. 167. Will you explain why the 1914 pistons were made like that illustrated in Exhibit 11 instead of that illustrated in Exhibit 9 and 10? A. The piston as made in Exhibit 11 was made from a standard piston pattern, and the only change was in the inserting of the double ribs, tying the bosses more securely to the piston head. The object in making these pistons was to give them a trial in aluminum, and not go to the expense of making up expensive patterns designed as shown in Exhibit 9, as these pistons were not to be used in the E.J.G. motor, they were installed for test purposes in a six-cylinder Buda motor."

Mr. Bruninga: Exhibit 11 is now Exhibit 62. Exhibits 9 and 10 are now Exhibits 31 and 32.

(Narrative continued) Now going back to the block test of the piston like Exhibit 48, those pistons were put into the motor, right on the block, and then another motor put in a Renault car and I ran that car then for 3,000 miles. The purpose of the block test was primarily to run in the pistons and also ascertain under load and speed if they would function without seising or scoring, before they were put in the car, before the motor was put in the car, to save time and expense in tearing the motor out of the car if it didn't work perfect. The motor was started right off on its own power: We had no method of belting motors in the new experimental department which was not complete, that is, no method of running them with another motor.

It was quite the usual practice in 1911 to run in a motor on a block, that is detached from the car, before it was put in the car. That run-in period varied anywhere from five or six hours to two days, depending on how the motor felt after they had belted it in or driven it by an electric motor, all depended on how it eased up and if it eased up freely it might be taken off in five or six hours, and if it didn't case up it might take 24 hours. That was done in 1911 in large motor plants, but

in the experimental department of our plant, which was a new department, we didn't have any facilities to do that. We had a block to run motors on but it was never equipped to belt the motors in, or it was never equipped with a generator, owing to the fact they were going out of the motor business. The main motor testing plant had not been moved into the new plant and in that department they could be run in that way, in the standard

form or in the standard way.

. The cylinder had been used with other pistons before that time. The piston used in the motor car was a standard piston without slits. The slotted pistons, like Exhibit 48, were ground. They weren't housed. There was no honing done at that time. They were fitted very close, and the motor went under its own power on the block immediately. The motor gave no trouble under the block test. The pistons were a very close fit, much closer than would have been with the standard type piston not split. It was unusual that pistons of any kind should be operated in a motor under its own power, without having been run in. It was not the general practice to do this. The pistons weren't honed those days, and the cylinders being in practically perfect condition in this motor, placing them pistons in there, it was done for the purpose of making a test, right from the start, to determine what effect the split skirt would have. We didn't follow the standard practice as used in other automobile factories. The standard practice was to run the motors either under belt power or motor power instead of under their own power for a period of hours until they would ease off, and this was not run according to standard practice. The pistons were placed in the motor and immediately started off to determine what the results might be.

The standard practice in 1911 was to follow the belt drive of the motor by operation on its own power for from 12 to 24 hours on the block. I followed that part of the practice of having them run under its own power. The test I gave them was enough to prove they weren't scining or weren't evidencing any scoring. They were simply, the oil pan was taken off and the cylinder walls looked at, but the cylinders weren't removed when they

were put in the car.

The practice of the car manufacturer in 1911, after he placed the engine in the chassis, was to give it a road test. It was not our practice in building the motors.

Our practice was to belt the job in, driving the motor for annumber of hours until it was properly limbered up and until it was put under its own power, and then the test ranged one to two to three to maybe five hours, all depending on the motor and its ability, and to test it to the final horsepower the motor had to show; it had to show so much horsepower before it was taken off the block and until it reached that point it wasn't ready to go off the block. That showed that there was checks in the pistons or bearings to bring it down, and a motor wouldn't be shipped until it showed on the dynamometer its rated horsepower it was guaranteed to do by the manufacturer. Now, the manufacturer of cars usually put that motor, put it in the chassis and took it out and drove it a short period of time. He didn't spend a lot of money driving it because when this motor was shipped it was ready to go, but he might give it a 25 or 50 mile, or maybe give it a hundred mile all depending on how it showed on the chassis, and if the motor didn't suit him after driving it a certain time, he would pull it out of the car and if he couldn't make the adjustments on it so as to put it back, the motor would be shipped back to us, that there was something wrong with it, either tight pistons, loose pistons, or something wrong with it, but how far the manufacturer would drive and what he would do, that was entirely up to him, not to us.

It was the job of the manufacturer of the motor not only to run the motor in on the test block, but from his standard first belting, then putting it in under its own power, then running it until it developed its rated horsepower. If it developed no trouble it was ready for the manufacturer of the cars, and his only job was to check up on the motor, because he didn't put it on the test block himself, he simply checked on the motor to find out it was all right to put in the chassis, and then his

car was ready for sale.

I know only in a general way what the Packard Motor Company were doing in 1911. The Packard Company built their ewn motors then, and it was the practice of Packard to run in a motor on the block, put it in the chassis, give it a road run, and if everything was all right the car was ready to be sold.

It might have been Packard's method to road run their cars a couple of hundred miles, but the car manufacturers we sold to weren't of the quality of Packards that they could afford to run them out a couple of hundred or five hundred miles. They depended on us to deliver motors that would run. We weren't building an-

I have no interest whatever in this patent. I cold absolutely all of my interest in 1917.

I have no interest whatsoover in the outcome of these proceedings so far as the validity of the patent is concerned.

The total amount of money I received for the sid patents, as well as the piston patents and motor patents, was \$2500.00, as indicated in Mr. Tibbetts' letter of March 27, 1916, record page 289-290. That is the only money I have ever received.

mber whether or not I charged for my I don't cur time in that interference proceeding; I don't think I did. I lived in Elkhart, only 12 miles from there, and I think I simply gave in my time. I was working for another firm at that time. I have no recollection of ever having been paid for my time, in fact, I know I wasn't. I never received anything additional for time, only for traveling expen

I have received no compensation for tentifying here in Geveland, and I expect none other than for expenses.

I have no understanding about it.

I have no interest in the Cleveland Trust Company whatever.

whatever.

I had no eniferences with counsel or anybody conserted with the Cloveland Trust Company before going on the witness stand this time. I saw them and telled with them but there was no conferences about the details of this case. I just telled with them. If telled with Mr. Richer, They simply ented me came questions about what I know hat there were no appearing about of the haid own to the top of the slot in the pieters, with as Exhibit down to the top of the slot in the pieters, with as Exhibit details not come up in my talks with Mr. McCov and 48, did not come up in my talks with Mr. McCoy and Mr. Richey.

Mr. Brunings: Cross examination closed. (Short record taken.)

Radinary Brantsarios by Mr. McCoy.

Office interference, Is testified as follows as to the relief of the head of the piston made by me in 1911:

"Q. 84. What was the clearance between the slitted pistons and the cylinder walls? A. The head clearance about the rings was made the same as the standard piston, it was about seven thousandths; the skirt elearance was made to fit the cylinder walls as close as it was possible to fit them in dry."

The skirt dearance was made to fit the cylinder walls as close as possible to fit them in dry, before the piston skirts were slitted. That is, the dimensions of the skirt, so far as the slit of that portion of the piston was concerned, was determined by the fit of the piston in the cylinder alcove before any alits or slots were formed in it. By "the clearance around the rings in the head" I mean that the clearance was standard and the clearance extended down to the slot (using Exhibit 48 as an example).

Referring to that part of the preliminary statement in interference 49,570, appearing on page 9 of the Gulick record, where it states: "that he conceived the invention set forth in the Declaration of Interference on or about the 25th day of August, 1911." I understood that to relate to Exhibit 36. I also understood the following allegation, in that same proliminary statement, to

relate to Exhibit 37: "That on or about the 25th day of August, 1911, he made the first written description of the in-

Vantion ??

The tests that I described during my cross-examination, related to certain equipment that was common in the industry, and of automobile motors, when I was conthe industry, and of automobile motors, when I was con-nected with the Excelsion Motor Company. The rela-tion between testing new parts and standard equipment are two entirely different factors. In the testing of new parts it is usual, if it is on the motor, to first test it on the block to some extent, and then usually put the motor in the change and drive a given read test, sufficient to satisfy the engineers as to its ability to function. And such tests constinue are carried on very abortly, and other times they are carried on to very extended periods until the desired results are reached. They may vary, change, they used to vary the block test; they weren't as good as they are now; block tests were short, not so severe, and they didn't get as much information out of the block test attended. tion out of the block test netually as they got out of hard road tests. For instance, the Packard Company

used to take their cars and drive them clear out to the Rocky Mountains, send me out there, and never come back to the factory until they broke down, maybe drive them 50,000 or 100,000 miles. That was road work. Boad work develops on experimental work things that are not developed on the test block. Road driving is one of the best developers in the world. Now, that is what takes place in preliminary and experimental work. In the standard chassis testing or standard building of cars, as with Packard as an illustration, they build their own motors, in this case they belted them in, run them without any power for a number of hours. They were very particular because they were high-priced cars. Then they put them on the block and they ran them on the block, and they didn't get the same results and same conditions by block testing those days as they are getting today because they didn't have the equipment, the refined equipment to do it. Then they run the chassis, and run the chassis without any body loaded them down with weights or sand bags and carried them over the road for 50 or 100 miles, until they were all run down, until the testing of the motor was O.K. That was the standard equipment, no experimental work on those cars at all, that was standard. There are two processes of testing one is testing for the customer and the other is testing for experimental work.

As to the relationship between experimental tests. and break down tests, it would depend a great deal on what the device was that they were testing. As an illustration, it might be a carburetor, and if they put it on the motor and they were able to set it so it idled perfectly, and run at high speeds perfectly, and done all the intermediate speeds perfectly, it would go out on the road perhaps 50 or 100 miles, and if under driving conditions the engineers believed it was all right, they wouldn't have to drive it a million miles to find out on the other hand, they might have some mechanical feature in the motor or other part of the car, and they would have to take it and put it through all kinds of tests and driving up hill and down hill, to find out how it would work and how many miles it would stand up. They might put a transmission on the block and run it a million miles on the block, under load, and grind it out and find out what actually happened under load. Those days they didn't do that.

At the time I was connected with Ercelsior Motor Company, when they desired to change the design of piston, about all they would do would be to make up a set of pistons, put them in the motor, put them on the block, and run them for a certain number of hours. Then they would inspect them and see if they showed any signs of trouble. If they didn't, they would be put in the chassis, put out on the road and driven at the discretion of the engineers until they accepted it as O.K.

As to the relation of such a test to stest of motors with standard pistons, it wouldn't have any definite relation, because after the subject was definitely settled, that the pistons were all O.K., and O.K.'d by the engineers, all of their dearance and all of the other parts are passed on for production, then that same class of experimental work or indefinite testing wouldn't go on. In standard production that would be subjected merely to the block

test and road test and then go to the customer.

The test to prove up the new equipment, the experimental test, is more severe than the test of the standard equipment. The experimental tests were a great deal more severe, with respect to pistons, in 1911, than were the tests of standard equipment. The difference would be that the block test in the standard job would be short. as a rule, and the road test would be what you might call. practically nil as far as mileage was concerned, anything from 50 to 150 miles. While in an experimental job the block test might be carried on, and at the same time they might have one or two motors on the road, and one or two motors on the block test run under load, carrying on both developments at the same time, and consequently the tests for experimental work were much more severe because each one of those motors is run for hours for all capacities, and then the road work given, and all the grief they can give them. As a general thing, more of the cars, more of the motors develop more trouble from road driving than they de on the block.

The amount of road driving that would be given such cars under ordinary conditions in the development of a new piston in 1911 would all depend upon the engineers themselves and upon their conclusions. They might drive it a thousand miles and they might drive it two thousand. They might drive it one hundred thousand miles. They might drive them over a period of a year, a practice such as Packard followed. They give them exhaustive times and exhaustive tests; they run them until they were run

out, that is all, until they were perfectly satisfied. Again, lots of other concerns didn't earry their experiments that far. They would put them in, the piston, or any portion of the motor, they would go in and do 3,000 miles on the motor without seining or scoring or burning out the bearings under good load and driving under normal conditions that would be considered fairly good by a good many of the manufacturers.

As to listons I tried out in 1911, I considered the tests I made on them on the block was sufficient to show their ability to work, and the test I gave in the ear and the amount of mileage that the Excelsior car was driven, was sufficient evidence that the slit idea was all right, but that, however, had nothing to do with the general testing of the piston and its ability to prevent itself

from breaking up.

At the conclusion of those tests, I was not ready to market a piston of that character without redesigning it, making it a proper design picton. After it had been redesigned it would then have to be tested out to prove the new design. It would be pretty hard to say whether it. would require a leaser or greater degree of testing than I gave these pistons in 1911. It would all depend on how it performed, the rib structure, and so forth, whether that would stand up and not break down, just how it would function under that new design, that would remain to be seen when it was tested out. If it started out and ran's test block fown thoroughly and run its mileage on the road for a co- ale of thousand miles, and didn't give any trouble, I would consider it practical and safe to proceed with; but, on the other hand, the way that class of stuff is tested out now, why, it is ppon an entirely different basis, the mileage is indufinite and the block tests are indefinite.

The conditions of testing would be the same in 1911 as they were in 1914.

Q. When your 1914 pistons were removed from the Amplex car in 1914, as you have testified, were you satisfied that your tests of those pistons were completed? A. I was satisfied with the tests as far as results of slotting was concerned, but I would not be satisfied with the test of the piston itself or its ability to absolutely stand up indefinitely, from mechanical design, as far as the piston itself was concerned.

(Narrative continued) The tests that I ran in my own car in 1911 were the conventional way of testing pistons at that time.

My method of testing new engine parts in or about 1911 had been with all of the new stuff that came out, it was put in my car, so that it would come under my personal observation, as I did most of that work myself. In other words, I did most of the observation work. And in connection with that, when we were manufacturing cars, why, there would be another set of whatever it might be, or another part put in another test car driven by some of the other drivers. The fact that my car was my own car made no difference as far as testing out the parts were concerned, inasmuch as some of the mechanies in the factory, in fact, quite a good many of them, drove my car more or less, and if something else came out that didn't sound out just right, they took my car and went over it to find out what the trouble was. I couldn't observe all of these things unless I had a car that was under my absolute control all the time.

My reason for permitting my mechanics and factory associates to drive my car was merely as a matter of observation. For instance, they would have to test the brakes and this and that, and every time the car came in, if there was anything new on it, it was up to the mechanics to see what they could find, see what they could see, see what they could observe as to the new devices.

I observed the operation of these pistons in 1911. My ear was driven pretty much all the time by myself; it was also driven some by the mechanic, Engle, and he rode up home with me practically every night from the factory, and all the time I was driving the car I was listening for anything that could go wrong, knowing I had the new pistons in, and the car was checked for overoiling, and cheeked for excessive heating, fuel consumption, and so forth, as in comparison with the other type of piston. Every day that the car was in my possession and I drove it or was there where I could drive it and put all the mileage on it I could, I always listened to the motor, and every day that it came into the factory Engle always inspected the motor and advised me if he saw anything that was going wrong or discovered anything that was going wrong; and the mileage test that was put on it was all the miles that I could put on it during the period of time in which I drove it.

The test observations I made in 1914 with respect to the aluminum pistons that were installed in the Amplex ear at that time, followed along the lines of, you might say, listening in, and in driving to determine whether the pistons were functioning properly or not,

checking the fuel, checking the oil consumption, for overheating, and such, any such matter as might or could. or any such trouble as might develop with the engine, regardless of what it might be. Every time that I drove the car I listened to it: I was always listening to it when I drove it because I was interested in knowing what it would do. Every time the car came in the man that put the pistons in the car inspected it. I don't mean he opened it, he listened to it, and when he would go out to get the car he would give me his version of what he thought was right or wrong. If it we all right he simply said O.K., it was all right, nothing is going wrong. As long as it developed no trouble on the road under driving there was no occasion to tear it down until it had miles enough on it to warrant tearing it down. It is not the general practice to drive a car on the road 200 miles, take it in the shop and tear the motor down. That is not the practice with any manufacturer, because they couldn't do it. It is the practice, however, of allowing their mechanics, their drivers, with some concerns, not all, to drive their test chassis home in the evening, to take their people out with them, drive it over Sunday, Saturday, and such like that, in order to get mileage on their different types I am speaking of, not their stock types, they get mileage on their cars with nothing to pay for but gasoline, there is no expense of labor to piling up that mileage. That is very common, a man can go out and take his family and go where he pleases, or take his friends.

(Short recess taken.)

After considering the affidavits, or preliminary statements, in Interferences 49,569, 49,570, and 49,571, about which I have been examined, Exhibit 36 was made in January, 1911. The descriptive matter attached to the exhibit, marked 37, was made in January, 1911. Those papers, Exhibits 36 and 37, were shown in January, 1911, to my wife and to some others within a period of about 60 days.

Q. When did you explain the invention as to structure and mode of operation appearing in Plaintiff's Exhibits 36 and 37 to others? A. Well, I explained them to my wife in January, 1911, and I explained them to other parties in January, 1911 prior to her leaving for the south.

(Narrative continued) The inspection and study of these preliminary statements does not change my mind as to the facts regarding which I testified. I made the tests of the motorcycle pistons at the Excelsior Company throughout the month, but it was prior to July, prior to the opening of the Motordrome; and the examination of the affidavit does not change my recollection of those matters. Nor does the examination of the affidavit change my view with respect to the tests run in the Renault car, or of the mtor which was afterwards used in the Renault car. It does not change any of my views with respect to any of the testimony I have given.

I received the original of the letter that Mr. McCoy handed me from his files this morning, dated August 22, 1923, and marked for identification as Plaintiffs' Exhibit

That is my signature to the letter from me to Mr. Ray Stewart Gehr of Cleveland, marked Plaintiffs' Exhibit 64. I wrote that letter to Mr. Gehr on or about the date shown on the face of it. The copy of the letter that was received by me (Exhibit 63) carried no signature, but it came from Gehr's office, and my letter in reply to it was evidence that it came from Gehr himself, and my letter, Plaintiffs' Exhibit 64 is a reply to Plaintiffs' Exhibit 63. Plaintiffs' Exhibit 63, Mr. Gehr's letter to me, is dated August 22, 1923, and my letter to Mr. Gehr is dated August 23, 1923. The preliminary statements came at the same time his letter came. I signed them immediately, wrote this letter, and got them off the same day.

The motors manufactured by the Excelsior Motor Company at the time that I was employed by them were all of the same type, but some of the customers required some changes in their exhaust manifolds, and some required changes in their water manifolds, and some required double-acting pumps instead of the single; and whenever those changes, those minor changes, not in the general construction of the motor, but when those minor changes came into effect, and they were purchased by a different customer, that motor was usually listed as soand-so's motor. The motors were all one motor as far as motor proper was concerned, one type of motor. For instance, the Vall people, the motors furnished the Vall Company were scheduled for certain equipment, and when the orders came into the fact, why, those were known as Vall motors. When we got out motors for the Mason Company, they would be known as Mason motors. That is to say, they were Excelsior motors with the customer's name simply attached designating whose motor it was.

While I was with the Excelsior Company, the companies who purchased their motors from the Excelsior Company were Stoddard Dayton, of Dayton, Ohio. (Those were used in what was known as the Stoddard-Dayton car.) They purchased motors in considerable volume. Mason Motor Company of Iowa. Vall Company. And there were a number of other companies that I don't remember the name of, smaller companies.

The applications for patent which I took out when I was with the Amplex Company, were all filed by me, and the attorney's fees for the preparation of those applications were paid for by the Amplex Company at that time, that is, prior to the first receivership and prior to the time of my leaving them in 1910; and none after that.

I left the Amplex Company in 1910.

The Amplex Company paid for all of the patent applications and for the patents, and the whole thing complete, for all the patents that I took out while I was with them up until the time I left them in September, 1910.

None of my inventions, from 1910 down to the present time, were handled in the above manner, relating to automotive parts, but all of my patents in connection with the musical instrument industry were handled in the same way, and that has nothing to do with the automotive industry. I might say the only difference between the two connections, the one and the other, between the Amplex and the Conn, the musical instrument end of it, I had an agreement in case the company became insolvent all patents were to revert to me, in the case of the Amplex Company. In the case of the Conn Company everything was assigned to the Conn Company, as I took it out, and they paid for it.

I entered the employ of C. G. Conn, Ltd. the latter part, I think it was about December, 1915, but I didn't become active in the factory until 1916 owing to the fact that there was a strike on there at that time and they didn't want me to step in, get mixed in the situation until the strike was settled: I remained with them until

two years ago this fall.

I did not pay much attention to the automotive industry generally during the time I was connected with the Conn Company, only what I read in automotive papers and Patent Office journals.

As to the cover on Exhibits 36 and 37, I have given this matter more thought since my casual inspection of that cover yesterday, and have this to say: When I de-

livered it to the Jackard Company it was in a cover practically the same in color and appearance as this one, as this folder. My recollection is clear on the subject now, it was pinned together with a pin in this way, it was pinned together with a brass paper clip, that is the Exhibits 36 and 37 were clipped together with a brans clip, and they were placed in the folder and when delivered to the Packard Company with blueprint—that would be Exhibit 32 Exhibit 32 was also in the folder but not attached; neither was the 36 or 37 attached to the folder, but they were held together with an ordinary paper clip. one of the wire paper clips over the edge. I was deseived in this situation yesterday, it has been so long since I seen it, my memory wasn't as clear as it might be, but in thinking it over I discovered the situation and the deception. I was very much surprised at that part of it.

I was testing new devices and equipment from 1905 until 1910 with the Amplex Motor Car Cor many, both in my own our and in company cars, and then in 1911 with the Excelsior Company, up until the fall of 1911, and then not again in my car, anything special, until 1914 with the Amplex Company, and since my separation with the Amplex Company I have still been continuing the tests. I made such tests during the period of my connection

with the Amplex Company in my personal car.

Mr. McCoy: That is all. Re-direct examination closed.

Be-Cross Examination by Mr. Brunings.

I read the Patent Office journals after I became connected with the Conn Company. I paid no particular attention to piston patents that were being issued. Nor did I pay particular attention to automotive parts in general. I, of course, looked them over. I was more particularly interested then in the musical industry because that was my business.

I followed motors in Patent Office journals in general because in reading them over I am interested in every-

thing mechanical that I saw that appealed to me.

I have an independent recollection of receiving the letter, Exhibit 63, from Mr. Gehr, because I received Mr. Gehr's letter at the time that I received the affidavits. I remember distinctly of receiving them and signing them and of writing my reply to them. I know I received the letter in connection with the affidavits. I don't know that I received those prints, but I am positive I received the

original of that letter, Exhibit 63. Since I have had occasion to read this I can recall very clearly his letter.

Exhibits 36 and 37 were attached together by a brass clip that goes over the edge and closes down with little spurs on it. That was attached to the top. I believe it was attached to the top, in the upper corner. I believe it was the upper left-hand corner. It could be readily separated, but it wasn't separated while it was in my possession. Neither Exhibit 36 nor 37 were clipped to the folder; they were not attached to the folder solid; they were loose in the folder.

Referring to Exhibit 48, and assuming that the reduction in diameter of the head goes right down to the slot, that would not show if it was only a few thousandths of an inch. It would show opposite the slot if Exhibit 48 was ground perfectly, but 48 isn't a representative job, 48 is merely to show the slotting, 48 isn't ground to no particular size that I know of. I don't know that Exhibit 48 shows that the skirt part below the slot is of larger diameter than the skirt part above the slot. I didn't grind this piston, I don't know how much it is ground, but it shows no evidence of it. If that had been a fact, there would be a ridge showing around the piston on the side opposite the slot, but it was not ground; it was not machined to show that purpose, it was machined to show the slotting idea.

Exhibit 48 was the piston that was before me during the taking of the testimony in the interference proceed-

ings in 1926.

As I understand it, the preliminary statement, on page 9 of the record, interferences 49,569-570 and 571, related to Exhibits 36 and 37. I gather that from the fact that it is stated that "he has not reduced the invention to practice other than by filing his application."

The statement in the preliminary statement on pages 2 and 3 in interference 49.569:

"he first embodied his invention in a full sized engine which was completed about the 25th day of August, 1911, and that on said 25th day of August, 1911, the said engine was first successfully operated at the city of Chicago, County of Cook, and State of Illinois, and that he thereafter confinued to use the same and pyoduced and successfully used one or more additional engines embodying said invention"

relates to the piston like Exhibit 48 that I tried out in the Renault car in 1911; and the date of the 25th day of

August was gathered from the fact that that engine was

run over to the Elgin races.

The statement that the car was driven to the Elgin races is correct, and I am not absolutely sure whether the 25th day of August or the 25th day of July was the Elgin races, I am not clear on that matter yet, but if, in case the Elgin race was in July and the car was driven there, it would be reasonable to believe that the car was being driven with those pistons on the 25th day of

August.

On the date of the Elgin races those pistons, like Exhibit 48, were first successfully operated in the car. It was successful as far as the slotting was concerned, not as far as other elements, mechanical elements, was concerned at that time. The piston worked satisfactorily, perfectly satisfactory; there was no trouble with it. It worked to my satisfaction on the day of that Elgin race, and it worked to my satisfaction when it was run in on the test block before that time.

It is a fact that, as I said in my affidavit, on page 3, "that he thereafter continued to use the same." By that I mean that I continued to use it in that Renault car until November of that year, after I had found it suc-

cessful.

On page 2 of the record, the preliminary statement in interference 49,469 covers virtually two constructions for two pistons, it relates to the piston that was used in the Remault test car and it also refers to Exhibits 36 and 37; it is a sort of a double reference in there. That is the way it is, because the piston of Exhibit 36 was pot built, but the one that was in the car that is being explained here was the one which was in the Renault

car, which was Exhibit 48.

The August 25th, 1911 piston, Exhibit 48, was connected up with the Elgin races in Mr. Gehr's letter. can't say that I understood that thoroughly at the time I signed this preliminary statement, because from Gehr's letter and from these affidavits that he sent in, as previously explained, I expected he knew what he was talking about and there was a lot of leeway, as to date only; I took it when the statement read "on or about" I took it for granted there was leeway enough in there to work, and I approach at the time that he was sure of his date of the Elgin races. I took the 25th day of August to be the Elgin races, and when I said "about" that it would be around that time, because it was on the day of

the Elgin races that the piston like Exhibit 48 was actually put in a car and run for any distance.

As to the statement in the preliminary statement, on pages 2 and 3 of the record,

"and that on said 25th day of August the said engine was successfully operated at the City of Chicago, County of Cook, State of Illinois."

I can't interpret it as referring only to piston Exhibit 48. The one portion of the statement, to my mind, refers to the Exhibit 36 as the invention, and the other portion of the statement, the testing it in the car, to my way of looking at it, refers to the 48 which was being run as a test pinton; that is the only way I can interpret it. The latter part of the statement refers only to the test pintons in the Remark car, but in the prior part it refers to the invention proper, which was related to 36 in my mind. Exhibit 36 was the invention proper, and the split skirt idea was also incorporated in 48, but not designed as 36. I considered 48 as part of my invention, owing to the fact it was slotted, but not as to design of ribs, etc.

Referring to page 33 of the same record, the preliminary statement in interference 49,588, I understand what is meant by the following claim, and I understood what the operation would be of that construction at the time the preliminary statement was signed by me:

portion and a skirt portion, said skirt portion having a longitudinally extending alot formed through the thickness of its well, said alot extending from the rear edge of the fairt portion and forming adjacent disconnected portions in and skirt portion which are capable of being moved inwardly or outwardly without restraint."

That preliminary statement reside as follows: "Edward J. Guliek, of Elkhart, in the County of Elkhart, State of Indiana, being daily sworn, deposes and says that he is a party to the above entitled interference declared by the Commissioner of Patents. July 7th, 1923; that he contrived the invention set forth in the declaration of interference on et about the 25th day of August 1911, or first made disswings of the invention; that on or about the 25th day of August, 1911, he made the first written description of the invention; that on or about the 25th day of August, 1911, he first explained the invention

to others; that he has embodied his invention in a full sized engine, which was completed about the 25th day of August, 1911; that on the said 25th day of August, 1911, the said engine was first successfully operated at the City of Chicago, County of Cook, in the State of Illinois. and that he thereafter continued to use the same, and produced and successfully used one or more additional engines embodying said invention."

That preliminary statement is signed on the 23d day

of August, 1923, before John M. Ragle, notary public.

To my mind there are two references in the above statement, one reference is to the original invention, 36, and the other reference is to 48, which was driven in the car. That, to my mind and to my way of interpreting

that statement, that is what he refern to.

The pertion of the above statement reading: "that he first embodied his investion in a full sized engine which was completed about the 25th day of August, 1911; that on the said 25th day of August, 1911, the said engine was first successfully operated at the city of Chicago, county of Cook, in the State of Illinois," refers only to piston, Exhibit 48, and it is correct where it says: "and that he thereafter continued to use the same." That means that I continued to use piston 48 for the balance of the 3,000 miles.

The first that pistons like Exhibit 48 were driven in the car was to the Elgin races in 1911. I don't know how far it is from Chicago to Elgin, but I should say it would be around 60 or 65 miles—about 120; possibly driven that day 150 miles. That piston was given approximately 150 miles test; it stood up and gave perfect satis-

faction in that test.

I didn't tear the engine down when it got back to the factory, but I listened to it and it was operating perfeetly. I knew from my experience whether it was scoring the cylinder, by listening, and whether or not it was slapping. That pisten operated perfectly during those 160 miles. That is why I said in my preliminary statement that it was successfully operated. And therefore, I continued to use it for the balance of 3,000 miles in that Remailt car up until November, after that successful meetings.

ful operation.

The preliminary statement, on page 8, and repeated on page 33, stating: 'familithat he becauter continued to use the same and prelimed and successfully and one or more additional engines embodying said invention.' (after referring to records) has reference to piston 48.

The "additional" engine means the second engine which had pistons in the same as 48, the second engine that was run on the test block, not in the Renault, but the second engine run on the test block, is what that refers to, which had pistons the same as 48. There were two engines, one in the Renault and one on the test block.

In 1914 I put aluminum pistons like Exhibit 51, in an Amplex car, embodying the same idea as 48, as far as splitting is concerned but not as far as slotting around the top is concerned. The slotting around the top was simply continued all the way around. I had extra ribs on the inside. That was an additional test of pistons. Those pistons were never on a test block. They were put right into the car, were used right off the bat, just about like they run them off the line in the Chevrolet and Ford plants today. I was satisfied that they would work, if aluminum would work at all.

(Thereupon, adjournment was taken to 1:30 P. . M. of the same day.)

(Thereupon, at 1:30 P. M., Thursday, March 16, 1933, the hearing was resumed.)

(Narrative continued) Referring to page 33 of the Patent Office record, where it says that I produced and successfully used one or more additional engines incorporating the said invention, that additional engine was a second Excelsion motor. That motor was not put in the Renault car. The second engine didn't have the 1914 construction; that is the Excelsion motor didn't have it. But in the 1914 Amplex engine I also had pistons like Exhibit 51, and that piston had no flexible webs.

Q. And that would then be a piston which was defined by the claim on page 32? You only have to answerif you understand what that claim means; I am not asking you to interpret it.

Mr. Richey: Well, I object to the question. I think that is just exactly what you are doing, asking him to interpret the claim. That is for the court.

The Master: He may answer and you may have

your exception.

A. That would refer more nearly to—it is my opinion, I expect that refers either to 36 or 32. I do not think that claim referred to either 48 or 51 as far as the flexible arms are concerned.

Q. Do you find any flexible arms in that claim?

Mr. Richey: Same objection.

The Master: Same raling. You may answer that by yes or no.

A. No.

(Narrative continued) I don't remember what kind of structure that preliminary statement related to, but I am under the impression that it means 48. The preliminary statement would have reference to 51 also, because neither 48 nor 51 had flexible arms. I probably interpreted the preliminary statement as having reference to both Exhibit 48 construction, which was used in the 1911 car, and the Exhibit 51 construction, which was used in the 1914 car.

The pistons in the engine of 1914 and 1911 weren't alike. They were sufficiently alike, however, that both of them had the general construction without the flexible webs.

I knew that those aluminum pistons weren't left in my 1914 car, because I saw them in the alop when I came back from the East in November. I did not see them taken out of the car, but I saw them on the floor after they were taken out of the car, and I saw them the 11th day of November. That was the last day I was ever in that shop. I left the pistons under the bench, on a shelf. And that was on the 11th day of November, 1914, the day of the receivership.

I know that the cast iron pistons like Exhibit 48 weren't left in the car in 1911 because I saw them after they were taken out. Those pistons were thrown in a pile in a corner where there was some scrap iron. That

was a scrap pile.

Both the 1911 Renault and the 1914 Amplex car had been run for some time with other pistons before my split pistons were put into those cars. I don't know how long the Renault car had been run, but it had been run two or three thousand miles. The motor that was in the Renault car was a comparatively new motor which hadn't been run but possibly 500 or 1000 miles, and the cylinders were in good condition.

The cylinders on the Amplex car in 1914 and had about 600 miles of service, and they were in pretty good

condition.

It would be pretty hard to tell what might take place with pistons in a motor. Pistons put in a far like that and tested out when first run on the block or even

put in the car and run, may run indefinitely, they may run for years, never give any trouble, or one of them might give trouble in the first 50 or 100 miles; there is nothing

to go by on that.

So far as testing is concerned, if the slot of a piston was inoperative and there was any inclination to seize, it would show up in a very few hundred miles; it might show up in the first 100 or might not show up in two or three hundred; but if there was any inclination to seize or score, it would sconer or later develop. It would not develop after fifteen or twenty thousand miles, unless it was out of cil; it would develop in its early history, in its early operation. If it didn't develop within four or five hundred miles, it never would develop, unless it was dry of oil. If it didn't develop in 500 miles, it may or may never develop unless there was some abuse. A good many of those things happen and you don't know the cause or reason for it. Many of those things happen to a piston going wrong when there is plenty of oil in the engine, and there is no accounting for it, but in the case of this split piston, that didn't happen in either one of the tests. The split piston, when it was put in and tested out on the block, and driven in the engine, that was merely a preliminary road work test, but was in no way conclusive of what might happen in the future. The piston was not mechanically designed to be split up in that form, and it was merely a test of what the slotted idea would do. That test was run; when I returned from Elgin I was satisfied as far as the eletting idea was concerned. No. engineer would have been satisfied with the structural design. And the test was continued to see what would happen to the slotted idea only, and not the structural design; and something did happen.

After the Elgin test I was sufficiently satisfied to tell the Patent Office in my preliminary statement that it had been successfully tested as far as the slotting idea was concerned. It had been successfully tested up to that time. That is as far as if had gone. As far as the principle of operation, it had been successfully tested up to that time and further on from that time the tests were conducted up to November, and it operated with one ex-ception, when one of the pistons gave way through the piston, a breakage that was not due to the splitting of the piston in any form except the wakness of the piston; was not due to ecoring or seising.

That Bennuit car had four sylinders. The other

three pistons were operated in the car until we finally

134

took them out. The piston we replaced went on through, but that was just merely good luck as far as mechanical structure was concerned, had nothing to do with the splitting whatever; all the splitting did was to show what it would do as against seizing and scoring, see what would happen; and it did; that piston, 48, could not be

made as a commercial proposition.

I don't know as I could enumerate where all the car was driven in 1911. I drove it around Chicago, out in the country various places around South Bend all the spare time I had, evenings and such like I was driving the car because I wanted it under constant observation so as to knew just exactly what the pistons were going to do, how they were going to finally wind up and work out as far as the split was concerned. I was not interested in anything else in the piston.

The engine was expend up when the crankshaft broke and the pistons could be removed from the bettom,

but the pistons weren't pulled out until the broken one, but the motor was turned over after the shaft was put in. they were shoved up in, and you could see the walls were in perfect condition. I saw the motor when the broken piston was taken out and when the new crankshaft was put in, and I couldn't say whether Engle palled the pistons all out himself and shoved then back or not; but they were in the motor when I naw it; they were all in the motor when I naw it. Then later on when the miston broke, all the other pistons weren't removed, simply one piston put in its place. It is very easy for any one to observe by shoving the piston to the top; if there is any scoring or sessing, it will show on the cylinder wall.

It paid for the gasoline on that trip with Mr. Wil-

liamson. The company didn't furnish the gasoline for anybody. I had to furnish the gasoline for all the driving in the test work. The company wealdn't furnish gasoline for anything. It was the company's car; I used it only for this test purpose. It was just a matter of courtery for me to the company. I had to fernish the gas and oil, or I couldn't have completed the test. The company furnished the coar. If was marry a matter of courtesy. It was factory manager, and as long as I was there I could drive it and do us I pleased with it us long

as I paid for it.

I don't know as I took any extraordinarily big trips in 1914 with the Amplex car having the aluminum pietons. Lots of Saturdays and Sundays Lidrove 150 er Longon broket and the best made the Contract of the contract o

200 miles, from Michigan, around various places. I was interested in putting all the miles I could put on it to find out what it could do. I couldn't afford to hire a man to drive it all day as a test proposition; so I had to drive it myself as much as I could. Some of my mechanics went with me on a number of occasions. The boy that put the pistons in the car was with me. A man by the name of Moran, who was in our factory driving test cars, was with me; different ones in the factory were with me. I think Randall was in it, and he also drove it to see how the pistons operated; and different ones connected with the company. At other times there may have been other people that rode with me. There is nothing to prevent that; that is common practice with all automobile factories.

I had no neighbors at that time. I was a single man.

I did not drive the car for pleasure, if you want to call it pleasure; you can call it anything you like. I drove the car back and forth. I lived in Elkhart, part of the time in Mishawaka, and I drove it mornings and nights. Or if I had to go down town. I drove it evenings. The primary object of that driving was to get my money back; it wasn't because I wanted to own the car; and the second object was to test the pistons thoroughly. I put all the mileage on it I would, and I spent all my available time testing it, and having many employees of the factory observe to see how it worked, and they observed the results every day that the car was in the factory, but not used for a private proposition for transporting people or joy rides, or anything of the sort; but it was my privilege if anybody wanted to go in the car and ride, it was my privilege to let them get in; it wasn't a public conveyance or public vehicle for transportation. I spent my Saturdays and Sundays going out into the country on trips in order to put mileage on the car. I had no other time to put it on.

My sole object in life was to determine what I was going to do with the business. I certainly had to do it on Saurdays and Sundays; I certainly wouldn't go out on Sundays and run around the block to put mileage on the car. I did the came as Studebaker or Packard; they let their employees and engineers take a car and drive it over Sunday wherever they pleased; it means nothing where they do it. The same companies, Studebaker and Packard, permit their engineers to own their own cars, and if that engineer wants to put devices on that car, he has the privilege to do so, but still those devices belong

to the Studebaker or Packard, and he has them on the car, but he drives it for pleasure and everything else, and to make observations, he has it under his observation, or otherwise the engineer has nothing under his observation and there is no other way he can do it, whether it is his car or the company's car. Nearly all the engineers own their own cars.

There was absolutely nothing else but the piston on that car to be tried out. The rest of the car was an old

tried-out proposition.

I did not measure those pistons with micrometers after they had been taken out. I was interested in the wear, but I had no opportunity. If I could have carried it on, got the plant back and gone into it and gone to work after the 11th day of November, I would have known all about it.

There were a few who tested the pistons with a micrometer to see how much the wear had been, and a lot that didn't at that time. Most all concerns, the majority of them, took a good big guess by looking at it, and if it didn't score or seize, it was said to be O.K. That is about all the micrometer that was used in those days on pistons. That wasn't my idea, but that is the way it was done. I might explain to you for your benefit, though, on lots of occasions the pistons came off the test block or also came off the test car when the engine was loggy and the driver could tell very easily that the pistons were some times too tight from two conditions; the engine was loggy and the engine het up. Now, that engine would be brought in to us and the pistons pulled out to determine which piston was making the trouble. Possibly none of the four bistons had scored yet, but they would be slightly marred, blue spots, or high spots in places. The only thing that was required to fix that was to take a file and make a light brush over the high spots and put the pistons back in again and the job would go on and perform very nicely and eliminate those two or three particular troubles. That is the way the piston worked, that is the way they did.

It was not our idea to take the micrometer and test how much wear had been on the pistons, because of the fact that after the piston had been in the car and been in the test block for 24 hours or 12 hours and then put in the car and came out of the car, and if you took out the micrometer and run it over it, you couldn't tell whether round or bquare, because it was never round, it was always out of round, always being out of round

you had to make a guess calculation as to just exactly how hig it was. If every one of those pistons was positively miked before it was put in the car and a record made of them, all well and good; but they didn't do it those days, they don't do it these days. They do mike them very closely these days. We fitted them those days with a feeler, very similar to what they do these days. The ordinders weren't always the same size, they would vary from three to ten thousandtha in the bore, because they were rough bored, they had to be ground. They weren't all round, they weren't all the same diameter. The pistons were fitted according to the bore with a feeler. We didn't measure the size of the piston clearance because the pistons might be distorted in various directions because of the cybinders not being perfectly heat-treated. The recult was that when you took it out even if you did use the microsseter, you didn't know what was wrong any more than you did without one.

wrong any more than you did without one.

I never miked the aluminum piston in 1914, It was miked when it went in. They had to measure the cylinder, mike up the pistons to get a close fit. It wasn't miked when it was taken out. Miking when you take it out doesn't mean a colitary thing, if they are out of round eight or ten thousandths, and there is not a piston made that does not distort go out of round; not one even

to this day.

Q. All you really aid was to look at them after they had been taken out, those aluminum pistons?

Mr. Richey: That is not a fair question. He has teld what betdid. He said a good many more things, and now he is asking the same thing over again, and I object to it.

The Master : Yes; that will be sustained.

(Narrative continued) I didn't make any piaton tests before 1911. Pardon me, I was thinking of split pistons. The tests of pistons that were made prior to 1911 were all in two-cycle motors. There were several hundred motors made, but the piston tests when once set as a standard for the year's prediction, was scarcely over disturbed after that. Whenever there was a new hore developed or new type piston developed, which was only on two occasions in the history of the business, then of course that piston had to be tested out; after that the pistons were only tested in the engines as a commercial proposition; they were never on the block. Once de-

veloped, that was the end of it for that season's production, because there was only one size of engine made.

one size piston.

When I said that pistons like Exhibit 48 weren't ready for the market in 1911, after I took them out. I meant they weren't ready mechanically. The alitting and slotting idea was proved to be good, but the mechanical construction of the piston would suit nobody, no enconstruction of the piston would suit nobody, no engineer; that wasn't a marketable proposition. What I wanted was the decible web construction. I wanted a piston engineered up to date as it ought to be to carry out all these ideas. That piston was absolutely no good as far as a marketable piston was concerned; yet it did prove out the slotting idea; that is all I saked of it. That is also true of the 1914 piston, a matter of proving it from an experimental standpoint. The web construction was Exhibit 32 and Exhibit 36 was to my mind the ideal construction. That is what would have been put out if it had been carried through. The Exhibit 48 construction is just merely a by pass or subterfuge to find out what the slotting would do. the slotting would do.

Mr. Bruninga: Re-cross examination closed.

Ra-Dimece Examplearion by Mr. McCov.

Q. Were the claims that appear in the record of interferences 49,569, 49,570, and 49,571 under the heading: "The count of the interference" before you at the time you signed these various preliminary statements, if you recall, as shown on pages 1, 8 and 321

Mr. Brunings: Before the witness answers that question, I would like to call your attention to page 52 of the File Wrapper and contents which distinctly says: "Copy to said applicant and assignee." I may say it is the practice of the Patent Office to send these copies of these claims in these interferences direct to the applicant.

in tent I have been ween

direct to the applicant.

Mr. Richey: And the applicant world them to his attorney, and that is about it.

Mr. Brunings: I ham not objecting to the question. I just went Mr. Gulick to understand it.

The Witness: I iden't recall that it was.

Mr. McCoy: Examination cloud.

of the Annal of the an indicated against a fill of the field would have

Ra-Choss Examination by Mr. Bruninga.

I have read this record of interferences 49,569, 49,570, and 49,571, but this count of interference I don't recall of ever having been brought to my attention or ever having seen it in any form except as I see it in this book.

Mr. Bruninga: That is all. Before Mr. Gulick leaves, have you found that history Mr. Gulick dictated?

Mr. McCoy: We haven't found it yet.

Mr. Bruninga: I would like to have you pro-

duce it as soon as you find it.

Mr. McCoy: I shall do it. There are so many papers, in fact we have had a great stack of these interferences going on for a long time. Certain of those papers were turned over to me, certain of them were retained by Mr. Gehr in his files. I looked as thoroughly as I could last night and Mr. Gehr looked some last night, and he is looking today.

Mr. Bruninga: Is he in town?

Mr. McCoy: Yes, he is. He is going to call me

if he finds those papers.

Mr. Bruninga: I might want to recall this witness for cross examination if that history is located; I didn't know until today that there was such a history.

(Short recess taken.)

Mr. McCoy: Mr. Gehr says that that original statement dictated by Mr. Gulick in his office was attached to this paper that appears in the record as Plaintiffs' Exhibit 62, the sketch, and that he cannot account food; he has not got it in his records; he has searched very carefully for it; and my office has searched very carefully for it; so we just don't know where it is.

The Master: Anything further about this state-

ment or this history!

Mr. McCoy: No, your Honor; I don't know any way to account for the loss of that paper except it was not important, no one regarded it as important after the testimony was taken in the interferences. I don't personally remember it. Bo you, Mr. Richey?

Mr. Richey: We have made a thorough search

for it and can't find it.

Mr. Bruninga: That is all there is to it.

(Thereupon the witness testified as follows in answer to questions by the Master.)

At the time I was operating this Renault car in 1911, I owned a Packard which I bought about the middle of 1911. My wife drove that mostly, and I drove the Renault car. In 1914 I was driving only the one car; I had no other car; and I had no wife then; I was single.

The affidavit which appears in the File Wrapper at pages 27 and 28, under date of December 2, 1921, read-

ing:

"That said invention was incorporated in an automobile engine and successfully used in the United States prior to the month of October, 1915."

might refer to this piston here that was used in the Amplex car in 1914. It could refer to some other use; I would say, the way it reads there it could also refer to 48, because that was prior, too. It could refer to the use in the car of 1911. The only other use was on the test motor. It was never driven on the road except in those two cars. Those are the only uses in the cars and on the road tests.

The Master: Anything further?
Mr. McCoy: Examination closed.

Mr. Richey: There have been so many references to Mr. Gulick's testimony in the interferences that I am going to offer in evidence his entire testimony in that case.

Mr. Bruninga: You mean his deposition?

Mr. Richey: Gulick deposition.

Mr. Bruninga: Yes, I have no objection if you

limit it to the Gulick deposition.

Mr. Richey: It occurs at pages 528 to 591 of the record in the Court of Customs & Patent Appeals, and pages 40 to 103 of the Patent Office record, which are the same pages. That has been marked for identification Plaintiffs' Exhibit 1-Z. I offer in evidence this Guliek deposition as Plaintiffs' Exhibit 65 here. I will offer in evidence the pages containing the exhibits referred to by Mr. Guliek, which are in the back of the record. I also offer in evidence the stipulation regarding some of Mr. Guliek's testimony at page 118 of the Patent Office record.

Mr. Bruninga: Let me make my objections as you go along. I have no objection to your offering in evidence pages 40 to 103 of the Gulick record in interferences 49,569 570 571. I have objected to the offer in evidence of the entire record before the Court of Customs & Patent Appeals.

Mr. Rickey: Well, we haven't offered that.

Mr. Bruninga: You have marked that for iden-

tification.

Mr. Richey: Yes, but we haven't offered it.

Mr. Bruninga: I think that should be separated, if you are going to offer them in evidence, unless you later on can get in the whole record. These particular places I do not object to at all, because I have quoted from them extensively. I think it might be well to include the preliminary statements in that, too.

Mr. Richey: Well, I won't offer them; they are

immaterial.

Mr. Bruninga: I certainly object to the offer in evidence of any stipulation to which I have not been a party, which Mr. Fletcher and Mr. Kingsland and Mr. Gehr signed.

The Master: How can you say that is com-

petent 1

Mr. Richey: It would not be competent under this offer. I will offer it later for another reason.

The Master: Very well

Mr. Richey: You don't object to the exhibits

offered do you!

The Master: If he doesn't object to the testimony, the exi ihits would naturally accompany the testimony.

Mr. Bruniaga: As far as exhibits are concerned, I would like to look at them. Up to Exhibit 23 I have no objection; although you already have

Mr. Richey: I don't think there is any use of putting them in; it is duplication. You saked for

Mr. Bruninga: I just saked you if you were going to put them in. I think it is not necessary to put the exhibits in. We might readily agree how they correspond to those in the record, and I am perfectly willing you should submit a list up to Exhibit 23.

Mr. Richey: We will leave it that way. Mr. McCoy, will you so prepare a list showing the corresponding numbers in the exhibits, and in the exhibits in this suit? Then we can withdraw these exhibits. That, I understand, concludes Mr. Guliek's testimony. Now, before the defendant closes its case, I say the plaintiff charges that Exhibit 3-0 infringes the following claims of the patents in suit: Guliek 1, 4, 15, 25, 33, 34, 36, 42, and 43; Mooers 3, 4, and 11.

Now, do you close your ease?

Mr. Bruninga: You haven't given anything ex-

cept the Guliek patent on that 3-J.

Mr. Richey: In connection with my notice under both 3J and 3-0, I make the same reservation I did with respect to the others; that is, I don't mean there aren't other patents owned by the plaintiffs, or one of them, that are infringed by these pistons. We didn't know at the time the unit was brought that the defendants were making and selling these pistons that have been brought in here since.

Mr. Brunings: Do I understand it now 3-0 you contend infringes the Guliek and Mooers patents, and those are the only patents in suit?

Mr. Riebey: Yes. Of course if there were any

others we would sharpe it.

Mr. Bruninga: As to 3-J you contend that only infringes the Gulick patent?

Mr. Richey: In suit, yes. Now, is your case

Mr. Brunings: Well, I am still waiting for you to declare yourself as to your position with reference to Exhibits 48 and 51. We had the matter up before we left here the last time. If the Master wants me to britily review it. I will do it.

Mr. Richey: In other words, his position is that he doesn't propose to close his case until we make an argument on some features of the case. That is most unusual. We will state our position with regard to the evidence when the evidence is all in.

The Master: What is the question that is precented here? It don't know as I got it clearly so as to pass upon it I don't want to go into the argument of the case. In order to pass upon this question I may have to hear you for a few minutes.

Mr. Bruninga: This is in no sense an argument. In the record, on pages 1324 to 1327 appears the following:

(Thereupon counsel read said portion of the record; also from pages 1336, 1348, 1349, and 1365; and further argument was thereupon had by counsel for the respective parties.)

Mr. Richer: Suppose we take this suggestion: suppose we go ahead with the case; you close your case, and we go ahead with our case; then you will learn about the Schoengarth and these other pistons from the rebuttal testimony; then you will have all the rebuttal testimony of that; then we can take up the questions of surrebuttal.

The Master: Of course that is when it would

come up in the normal proceeding.

Mr. Richey: Just so we don't decide it now. The Master: That is fair enough. I don't want to close the question now because it seems to me, as I see it, there is something to be said for the defendant on this.

Mr. Richey: Let's cross that bridge when we

come to it.

The Master: Very well, with that understanding we will proceed.

Mr. Richey: Is your case closed?

Mr. Bruninga: We are just at the point right now, whether technically closed or not, I don't know. The question will come up after you state your position.

Mr. Richey: Then I move that the defendant be required to close his case now.

The Master: It is closed, as I understood, with that reservation.

Mr. Richey: That he make a motion to take surrebuttal

Mr. Bruninga: The Master can make his ruling. The Master: I will leave the question open as to the right to take surrebuttal. I think that is what hir. Hickey asked me, not to pass on it now.

Mr. Richey: "Then his case in chief is closed, as

I understand it.

Mr. Richey: I offer in evidence as Plaintiffs' Exhibit 66 a copy of a Patent Office record, a list of applications of Elmer C. Long filed in the Patent Office.

Mr. Bruninga: What is the purpose of this,

Mr. Richey: Why, the same purpose for which you asked Mr. Gulick how many applications he had filed in the Patent Office, with respect to Mr. Long.

Mr. Bruninga: Is this supposed to include all

of Mr. Long's applications?

Mr. Richey: As far as we know. I don't know that it includes all.

Mr. Bruninga: I have no objection to offering a thing like this, only the very first check shows the application of December 9, 1918 isn't included.

Mr. Richey: Well, you have to complain to the Patent Office about that. I am offering their record in here. I don't mean to say that it is complete; if we find any others, any evidence of any others, we will offer them, too.

Mr. Bruninga: The only objection I have is that it is not complete. I have no objection to put-

ting it in.

The Master: It will be received.

Mr. Richey: Now, my adversary has effered in evidence Patent Office record including an opinion of one Patent Office tribunal from interference 49,569, and he has also offered in evidence Exhibit 4.L., another Patent Office record which contains reference to interference 49,569; and I am offering in evidence as Plaintiffs' Exhibit 67 further portions of the record in that interference as follows: 67.A., the portions of the record consisting of pages 104 to 281 of the printed record of Guliek, pages 592 to 769 of the court of appeals which was marked for identification Plaintiffs' Exhibit 1.Z. and such exhibits as go therewith that are in the back of the record, and which are not already in this case, but will be covered by the list that will be put in.

The Master: What is that testimony?

Mr. Brunings: That is testimony of witnesses, your Honor, on which I never cross-examined. Mr. Richey: Rubibit 47-L contains some of the

Mr. Richey: Righibit 47:L contains some of the records of that interference. You put in this opinion of one of the tribunals.

(Thereupon argument was had by counsel for the respective parties, and the question was taken under consideration by the Master.)

Mr. Richey: I offer in evidence as Plaintiffs' Exhibit 67-B, the opinion of the Examiner of Into 817 of Plaintiffs' Exhibit 1-Z. As Exhibit 67-C-

Mr. Brunings: I have no objection to the opin-

ions the

Mr. Richey: An 67-C an opinion of the Board, which appears at marce 620 to 622 of Exhibit 1-Z. Board of the Patent Office. As Exhibit 67-D, the opinion of the Court of Patent Appeals in the same

Now I offer in evidence the following decisions from interference 49,575; 69-A decision of the Law Exeminer; 68-B, decision of the Board; 68-C, deci-sion of the Boart of Appeals of the District of

I offer in oriflenes the following decisions from interference 40.870; the full creery of which has been marked for identification Plaintiffs' Birkibit 2-Z in this case; as 40-A, the opinion of the Birminer of Liberfleness appearing at pages 613 to 615 of Birkibit 2-Z; as 40-R, the opinion of the Beard, the petition for redescring, and the opinion of the Board on the patition for redescring, appearing at pages 617 to 605 of Birkibit 2-Z; and as 60-C, the opinion of the Court of Cantons and Patent Appeals in that interference

in that interference.

Now, in connection with interference 49,671, I offer in evidence as Exhibit 70-A, opinion of the Examiner of Interference; as 70-B, the opinion of the Beard of Appeals in the Patent Office. That case

Mr. Bruings: I have no objection to the offer in evidence of Exhibits 67-B, C, and D; 68-A, B, O; 69-A, B, C; 70-A and B. L do repeat my objection to the offer in evidence of 67-A.

(Thereupon short reces taken)

C. H. Swarr, a witness called in rebuttal by Plaintiffs, being first duly sworn, testified as follows:

Denor Examplation by Mr. McCoy.

My name is Charley H. Sweet, and my sildress is Marion lows. (Burego work is what I have been long time, and I have some tracks, operating the besides, but garage is the main because My h

is located at Marion, Iowa. I am engaged in repair work, automobile repair work. I started in that line of work, well, I went to Kanen City to an automobile asked in October, 1914, and came back from there in the latter part of February, along the lat of April I started to work for Bill Kinney. Before I went to Kanen City to the automobile asked I lived at Tipton, Iowa. After I returned to Pipton, Iowa, in Pebruary, 1915, I went to work for Bill Kinney. I couldn't tell you where Mr. Kinney is now. I worked for Mr. Kinney from around the lat of April until in November, according in November I got sick and I was off from work then until the latter part of February. Betteen February and April of 1915 I did nothing until I get the job with Kinney.

The nature of my illness in November, 1915 was, I was working on the ear in the movember, 1915 was, I was working on the ear in the movember in November until the latter part of February 1916.

The nature of my illness in Movember, 1915 was, I was working on the our in the mow and get passessails from it. I was sisk from somewhere in Movember until the latter part of February 1916, that is, from Movember, 1916, to Whenevy, 1916. If then went both to my job, and the job was gone, he gave it to somebody classand then I half to wait. I then found a job at Marion, lows, the 18th of March, 1916. I moved from Tipton, lows, to Marion, Iows, on the 18th of March, 1916. If place that date by the fact that it was the first time I had been both to that town since to work there and that is why it study in may grave, which is the day I went book there to work, and I mover went book to Tipton.

I know Gustave Mossimoistr. I first not him in the fall of 1915 at the fairgrounds once track at Tipton.

Three Gustave Mondomeier. I first most him in the fall of 1915 at the fairgrounds race strack at Eipton. That was before I had been to athool at Kannas City. The circumstances of that meeting were: just like all young fellow, crossy for a race car, and I hung around there and got acquainted with the got talking to him. I knew he was staying at Eipton, and naturally a young fellow will hang around where that stuff is, that is how I got acquainted with him. He had a Stayer race car. It had a Ro. 9 on it. I didn't pay much attention at that time until later on I got more interested in the car. Being around the garage, I got more acquainted, you know, and then until I want to Kannas City I had been around to the garage quite often, and he was storing it in Kinney's garage and maturally when I had the time I would go up and look the car over. That was before I would go up and look the car over. That was before I would to school in Kannas City in 1914. I now that car after I returned to Eipton in Pobrussy of 1915, it was there in the garage of Mr. Kinney. The consists for my seeing

it was I just went in and just looked to see if I couldn't get a job, and the car was setting just around the corner inside of the garage where he stored it. I went in and asked about a job and he said he couldn't give me one, he would as soon as he could. Of course the car was there, stood there in the corner, just like they had left it. I didn't pay any more attention to it then until he got ready to clean it up for the races in the summer.

I got the job from Mr. Kinney. He told me when it opened up he would give it to me. That is the same William Kinney I have spoken of before. There was work done on that ear in that garage while I was employed there. I helped on the one; I helped tear it down. The occasion for tearing the car down was he wanted to make the car faster. There was a man by the name of Baker in Davenport had a race car a little faster than he had, and he had beaten him and Mondameier wanted to make his car a little faster. He thought by tearing it down and overhauling it and by putting in some aluminum pistons he could do it; and that is the way he went at it to try it. I personally ground the bushings after the block came back from Cedar Rapids. The block was taken out and sent to Cedar Rapids to the Faucett Machine Company. They rebored it for a set of aluminum pistons, and had them fitted in the block and then it came back, and when it came back they bored new bearings. While they were boring the new bearings I ground the valves, and after they got the bearings all fitted and the pistons fitted on the connecting rods, I helped put the block on and bolted it down.

The Bancett Machine Company is located at Cedar Rapids, Iowa. Fancett it is spelled. I was there when the block was taken off from the car. By "block" I mean the part that has the cylinders in it. The block really is the cylinders. There were east iron pistons in

those cylinders. II am sure of that.

Those pistons were just straight east iron pistons, nothing different to them than any other pistons at that time. They did not have any splits or alits in the skirt. I saw the block when it came back from the Fancett Machine Company. It had been rebored. The aluminum pistons also came with it. These aluminum pistons were just like the old cast iron pistons that were taken out, with the exception they had a concave head, and they were, sh, they had, I should judge the pistons—now it is a long while ago,—I should judge they were pretty close

to a quarter of an inch thick through the skirt, what I mean the skirt, is through here, the bottom of the skirt, looked to be a quarter of an inch through there, they might not have been. I didn't measure them; and there was no oil channels and no oil grooves in those pistons. I am sure of that, and there was no slits in the skirts. Those pistons were put on the connecting rods, when the connecting rods were fitted, they were put on the connecting rods and the block was set down in and it was installed. I helped hold the block up while Mr. Monekmeier put the pistons in the block. The last I saw the pistons, they were hanging on the connecting rods and I saw them going into the block when they were going into the motor. The motor was then reassembled. The car was taken out to the race track, after it was all seally to go, taken out to the race track and drove, oh, I don't know how long, a couple of days, or three, to loosen it up. It was tight. The bearings, as were all new bearings, were real tight, they had to pull it to start it. I don't know how far they drove it. Of course they towed the car out. They had to tow it back and forth. He drove it, the first race after that was at Anamosa, first race following that was the Anamosa fair. I know that because I was there at the time, I was running the place while Mr. Kinney and Mr. Tracht, his partner, were out to the races. I had to run the place until they came back. I didn't see the Staver No. 9 car that was owned by Mr. Monekmeier at the races, I wasn't there. I seen the car come back. I did not attend the races.

The Master: He had charge of the garage while

they attended the races.

The Witness: I know they came back, and one of the boys came back with them and brought a picture of Mr. Tracht sitting on the back of the Staver No. 9 with a piece of bacon in his hand. He was a big fat fellow. I remember that; he came back there; he got the bacon. I remember that distinctly because of the picture hanging around the garage for quite a while.

(Narrative continued) The other persons working at the Kinney garage at the time I was there, were the two partners, Tracht and Mr. Kinney, and Jack Henderson. I mean Everett Tracht, called "Cappy Tracht." He was a partner of Mr. Kinney. I don't believe Mr. Tracht worked on the assembly or disassembly of the

Monekmeier car; he was a vulcaniner, a tire vulcaniner; I don't think he done much on it. Others working on that car besides myself were Kinney and Gus and Jack Henderson; Jack Henderson did the washing of the old parts as they came out, he cleaned up the crankcase, done that kind of work; I don't think he done any work on the car only that, just to wash the parts. And Everett Shipley was riding at the time, and Everett was there, helped on the car, too, but you can't get Everett, he is dead. At that time they all carried a mechanic or assistant, and Everett was riding with him as an assistant.

I know what a aplit skirt piston is. The first time I ever saw a split skirt piston I thought it was broke. That was in 1921 or '22, I took the piston out of the ear, and I thought it was broke. I said to the boys at the time, "The piston is broke," and they said "No, it is sawed for some reason or other." And then we took them out and found they were all that way. That was in 1921 or 1922 at Marion, in my own place of business. I think the car was an Oakland. Ben Butter owned that car at that time.

car at that time.

During the time II was working in Mr. Kinney's garage from April 1915, until November 1915, I naw two other sets of aluminum pictons. The circumstances under which I saw those pictons were: "Mary" Jordar—I easit thick of what his first name is, they called him "Mary" at Springville, had a National and he wanted that rebored and gluminum pistons put in. So he brought it down to Kinney and Kinney made him a price, so they took the car to Faucett Machine Company and had it rebored and put aluminum pistons in there. After that, after he had run that, he brought it down to Tipton, towed it down to do some work on it, so I saw he had aluminum pistons the same as in Monakmeier. So Kinney went out and talked to Reed Carl to get him talked into putting in new aluminum pistons in his Buick, because Reed was a speed frend, and it was a 16, I think it was a 16 model Buick, and he wanted more speed, it was a roadster, and he wanted more speed, so they put aluminum pistons in that. Neither of those sets of aluminum pistons put in the Forden cur or the Regd Carl car were split. If new each set of pistons as they were put in the care. If couldn't see them after they were in; I now them as they were put in the care. If he were put in the without being split. I saw the Buick torn thown after the original installation, and I saw the Jordan took his block out. Jordan is a druggist in Springville, Iowa.

He is there now as far as I know. I have an idea the National car in which those pistons were put is junked. The model 16 Buick that Reed Carl had aluminum pistons in is junked. The mechanic that worked with me bought the Reed Carl car and they started to overhaul it, and threw it on the junk heap.

I never saw the iron piston, marked Defendants' Exhibit 3 V, in that shape (after inspecting same); if I saw that piston, it didn't have these holes and it didn't

have this here.

Mr. Richey: Referring to the T-slot?

The Witness: This slot here and this slot here and these holes; there was no oil channel in that piston at all (indicating oil channel).

(Narrative continued) The oil goes down, the rings scrape the oil into this, that is an oil channel. There was no slitting; if that piston came out of Monokmeier's car, this wasn't in there (referring to the splits). I am positive of that.

(Witness handed aluminum piston marked Defendants' Michibit 2-W.) I do not recognize that piston in that shape. This hade wasn't here nor that wasn't there, but I do remainler (I m stating something about going to take the pistons down and hore holes in here, but whither he done it or not I don't know; but this was not in the piston when it was put in the ear. (Indicating the alote.). He might have tore the ear down after I had it, that I don't know, but he never done this here. (Indicating the holes in the skirt and also the slitting of the skirt.) I am positive there was no allt in the skirt when we took the ear down.

I do not know what this case is about. The first I knew about it was yesterday. I don't know the man's name who saw me, I think his name was Wells, came to me and asked me about it and what I knew about it, and I told him. He asked me if I had done any work on Gus' car. I told him I had, and what nature, and I told him.

Mr. McCoy: Direct examination closed.

Cross Examination by Mr. Brunings.

I didn't know Mr. Wells until yesterday, first time.

Mr. McCoy: He is Mr. Robert D. Wells, of the firm of Cook & Balluf, Davenport, Iowa.

(Narrative continued) He came over to see me yesterdsy. The work I did on Monckmeier's car prior to the Anamosa race was in 1915, prior to November, 1915. I know it was prior to November because I got sick in November 115. I started to work for him in April 115.

I do not know what month the Anamosa race was, but I think it was the latter part of September; I can't swear to that because I don't know the exact date of it, but their fair is September, usually have it in September. I couldn't swear exactly to that, but I know the car was

fixed up for the Anamosa race.

I came to Tipton to work for Mr. Kinney along the 1st of April. It was somewhere around July and August, after I came to Tipton, that I fixed up that car for the Anamosa race; I can't say the exact month, but that is pretty close to it. I think it was closer to Labor Day than to Decoration Day; I couldn't tell you exactly as to that because we didn't have any races Decoration Day at that time.

Q. You would still say that if I tell you the Anamosa race was on June 10, 19151. A. June 10, 19151. I think I am pretty sure that was built for the races during the fair, whenever that fair was.

. (Narrative continued) I do not know if anybody was hurt in that Anamosa race; I wasn't there.

I expect Anamora is about 30 miles from Tipton.

There could have been two Anamoda races that year, but I don't remember whether there was or not. But that particular race was the one that I remember that Mr. Monokmeier's car was fixed up for. The way I remember that distinctly, because the picture was drawn of Mr. Tracht sitting on the back of the race car, that is why I remember distinctly it was the Anamosa fair.

I don't know why the picture of Mr. Tracht was on it, because Mr. Tracht was a partner there, and there was no room for him to sit on the back, and just had a place for him to sit there, and Mr. Tracht held up the bacon, and that picture hung around the garage for a long time. He was not a partner of Monckmoier. It was Monekmeier who brought back the bacon, but Tracht was supposed to be carrying it back, I don't know. It wasn't a picture of Monokmeier, but "Cappy Tracht" sitting on the back of his car.

Jack Henderson was working there at that time. The only work that Jack Henderson done on getting that car in condition for the Anamosa race would be what

little work would be around, he didn't do any mechanic's work at that time because he was no real mechanic. That was the only time, during the period prior to November, 1915, that Mr. Monokmeier's car was tore clear down that I remember of. That was the only time the pistons were taken out, during the time I was there. I was there every day except Sunday. I would have known if that car had been torn down at any other time, unless they tore it down Sunday and put it back the same day. They could have torn it down Sunday or Saturday night and had it back together by Sunday night and I wouldn't have known it because I wouldn't see it.

I was 27 years old at that time. I had passed through a complete automobile course in Kansas City. I

knew about the repair of cars.

I do not know where Henderson is now.

I saw that Monckmeier, Staver No. 9 car plenty of times in the garage. That was the only time I tore it down, that is to tear it clear down. We ground the valves, we might take up a bearing, that is the only time I saw it tore down. I did not take out those pistens. They took them out themselves. I now them taken out. I remember that no more particularly than I would working on some other job. I saw the pistons when they were taken out. Monckmeier took the pistons out himself. He took out the cast iron pistons like Elxhibit 2-V, except that it did not have either the slots or the holes, nor the alit in the skirt. I don't remember what kind of ring grooves it had; the rings weren't on, they were taken off the pistons. I didn't pay much attention to the spaces between the ring grooves; pistons were all made about the same at that time. I don't remember what kind of rings those pistons had. I was going to say these were Simplex rings, but they wasn't. I couldn't say whether or not they had an Inland ring on them: I did not know the Inland ring at that time. There was only one ring in particular a knew of outside of the ones put on the pistons when they came from the factory, the Simplex ring, a little steel ring where you fill the alot up with them, I think 1/4" diameter, and then you fill the slot, fill the whole ring groove. The reason I remember that distinctly, we put them in a Ford, and one ring went over the top and tore off the whole piston.

I attended the automobile school in 1914. They didn't teach us how to make pistons. They just gave the instructions of what the different pistons and rings were

for.

In 1914 and 1915 I had not heard of any particular make of piston ring. I didn't hear of the Inlan ring and never saw it advertised in the ma have seen a piston ring like on Exhibit 3-W, but I h seen it at that time. That is an Inland ring. I can't tell

you whether or not the Monchmeier piston he took out of the ear had Inland rings on.

The first Inland piston rings I saw was in 1919. I bought a set of them and tried them in an old Overland, to try them out. It is a good ring. If he would have taken the ring off the piston, it would attract my notice; but to look at the ring on the p ton, it wouldn't attract my notice. I had never seen a ring to which the two parts overlapped for almost half of the directores until I saw the Inland ring. The salemann came up and showed it to me. If I examined the pistons Mr. Monck-meier had, to have them close to me. I am dead sure the pistons Mr. Monck-meier had, to have them close to me. I am dead sure the pistons Mr. Monck-meier had in his ear did not have holes postons Mr. Monekmener had to his ear did not have holes in the skirt. I didn't know that all the Staver pistons at that time had holes in them.

No other racing ears that I am had holes in the pis-tons. I am only one, just Monekmeier's racing our and Ford Steele's—only two racing ears built by the factory,

L BEW.

Beforeing to the wil groove in Exhibit 3-V, the ring scraped the cil down there.

Mr. McCoy: You mean the slot at the top of the skirt?

(Narrative continued) The top slot is what I call the oil groove. I don't know what it is specified for but the ring employed the oil down and it goes through there. I didn't know anything about an oil groove at that time. I call that are oil groove now. I hadn't seen any oil grooves in pistons at all before that time.

Q. You didn't know it was the practice to run a groove for instance like shown opposite the wrist pin bearings, all around the piston; I am referring to the groove in 3-V right above the wrist pin beare below the lowest ring land? A. You couldn't use that as an oil groove when you had holes drilled inside to let the oil get away.

(Narrative continued) That piston didn't have that goove. I don't remember it had that little spot there

or not. I didn't notice that, but I noticed this here around there, this bottom. -

Mr. McCoy: The transverse slot.

(Narrative continued) I wouldn't have noticed a groove right below the lower ring land unless you took the piston up and looked at it, which I didn't do. The piston was laying right on the bench. I didn't photograph it in my memory. I did not look for a slot in the piston, but if it had been there I would have saw it.

Q. That is your whole idea, if it had been there you would have seen it, and that is why you say now, it years later, you didn't see it; im't that right? A. There was no slot in the skirt of that piston or around the top when I took it out.

Q. I am asking you what you base it on; you didn't even take the pistons out of the asgine? A. I didn't take

them out myself, no.

(Narrative continued) I didn't put my other pistons back in I didn't go have and write down anything as to what I saw on those pistons. I didn't make any note, whether they were or were not ordinary pistons. I don't know how many cars I took down in that garage during the year 1915. I couldn't keep track of it. There were many of them. There were many of them.

There were many of them. There were Perm and Cadillac four. That Cadillac four had plain east from pursue. I do not know whether or not they were relieved opposite the wrist pin boson, that is, had parts out away opposite the wrist pin boson. I know they didn't have any splits or an oil groove around there for all I didn't particularly notice the construction of every pinton. den't know why I didn't. I can't say that I noticed the construction of the Monekmener piston any more than construction of the Monekmeier piston my more than I noticed the construction of my other piston that was taken out of a cur.

Q. In other words, as far as you remember now, 17 years afterwards the pistons that were taken out of the Monakmeter car were just pistons? A. You sir.

Q. That is what you remember now. And it didn't impress itself upon your memory, whether they were different than any other pistons? A. No.

Q. You just didn't notice it did you? A. I didn't

notice whether it was my different than my other piston, mo.

Q. And just because of that you are willing to swear they didn't have anything else in there, that they were nothing else but the ordinary pistons? A. Yes.

Q. You are willing to swear to that? A. There

was no slots in those pistons.

(Narrative continued) I don't know how long I saw those pistons. I did not look at them very long. I saw them when I went by the bench, when they were lay-

ing on the beach.

Mr. Wells came to me yesterday an asked me if I had ever worked on Monckmeier's Staver, and I told him yes. He wanted to know what I had done, and I told him. I told him I had ground the valves. He asked me what I had done and I told him I helped tear the motor down and send the block to Cedar Rapids and they had reground it and they put new pistons in, fit new pistons, aluminum pistons, at Cedar Rapids. I told him I didn't know whether they were east at Cedar Rapids or where they were made, but they came back with aluminum pistons fit on, and I ground the valves and Kinney and Monekmeier fit the pistons on the connecting rods and bearings, and I helped put the block on; that is the very words I need. He asked me if I knew what the pistons were like. I said they were just like the cast iron pistons that came out, with the exception that they were aluminum. He asked me if they was any different than the others and I told him, and he said, "Well, were they split skirt?" and I said "No." I said that without hesitating. He wanted to know how I knew it wasn't a split skirt piston. I told him the first time I ever saw a split skirt piston was in "21 or "22, and I thought it was broke.

Q. When did you first see a Chinaman, how old were

you! A. I don't know.

Q. You don't know, do you? When did you first see an Indian? You don't know do you? A. I was pretty young.

I never had any contact with a split skirt piston until 1921 when I first noticed a split skirt piston. That piston had a straight split up the side, with a hole right in here (indicating) and a cross slot here. The other side was just a plain straight, flat piston.

I took that particular piston out of a machine, and handled it myself, and I thought it was broken. I noticed it was split. I saw that it had a slot on one side. This other side had this there, but not split. It was

relieved from here down to there; it was a little smaller

here than it was down there. (Indicating.)

I know that because I could tell by the way it fit when we come to put the pistons in. I noticed that when I put it back, I noticed it had to go in from the bottom. It was not like Exhibit BBB in this case. The split was straight and there was a little hole drilled here. The vertical slot had a little hole drilled clear through, I don't know what the hole was for. (Indicating the point of connection between the longitudinal slot and the transverse slot.)

That hole was right close to the top. It didn't run into the ring lands. It wasn't free quite as much here. (Indicating the boss section.) It didn't have so much relief on the wrist pin boss. That piston wasn't like Exhibit 3 K, because this piston was supposed to be split in two when it was put in the motor. It wasn't like it except for that little hole, because this here slot wasn't

in the ring groove, it was down below.

I did not pick up and examine those cast iron pistons that were taken out of Monekmeier's car in 1915. I don't know what I was doing at the exact time those pistons were being taken out of Monokmeier's car. I helped tear the motor down. This I had to go some place else and they finished it up, I wasn't there when it was taken clear down, I just helped loosen the bolts. I was in the garage, I wasn't working on the car directly. I was in the place, The place was only 30 feet wide, and 80 feet long. I couldn't have been very far away. I may have been 20 feet away. I didn't examine the pistons when they were taken out. I saw them after, at Monokmeier's car. I knew they were for his car because I saw them take them off and put them there. I did not examine them. He took them out of the connecting rods and sent them to Cedar Rapids, and he had to put new bearings in for the connecting rods. He saved the pistons, the iron pistons, and carried them around with him. I didn't pick them up and handle them. I was working right along the bench where they were all the time. I glanced at them and saw they were pistons. I saw there was no holes in the pistons or no slots when they were there. I remember that from those few glances, if you can call it glances; it is like looking at a piston on the bench, you can remember whether that piston had a slot in it, looking at it. There was nothing that caused me to observe the piston closely.

Of the hundreds of cars out of which I had taken pistons, I couldn't tell you what kind of pistons they

0.

had in them. The reason I should think more of the Mosekmeier was because that was the first our I ever saw or heard of that had alumitum pistons, and we were arguing whether it would stand the heat and compression. That was the first our I work that had aluminum pistons. I remark out the pistons had a conservationed because he corried it account in his hand and hit it with a lame to show the boys how made strength there was in the should be about the boys how made strength there was in the should be about the boys how made strength there was in the should be about the boys how made strength there was in the should be about the same they are putting in accordance in the standard and should be get another one and that was the case plates and had to get another one and that was the case Mose and had to get another one and that was the case Mose and had to get another one and that was the case Mose and had to get another one and that was the case Mose and that was the case Mose and the transit around hit? we the land with a lamine. The made around hit?

A CONTRACTOR OF THE PARTY OF TH

That is the first blooding then I had not all the state of the state o

I don't know Mr. Jerdan's first upon. They called him "Mary." That is the same he goes by, is "Mary" Jordan. I den't know what his first mane is. He is a druggist in Optingville. He had that National var. He built it as a recer, and he had absolutely places in it. I saw those plates because he took the block off there and I saw that they were absolutely. Mr. Jerdan know Mr. Monekmeter, Monekmeter was the one who talked him into doing the job. Monekmeter and Kinney together got the commission on that

Bond Carl second that model 16 Built. That also had abuning platen. That was 1915, the same year. Both Jordan's said Carl's pistons came from the same place as Ministrations. I have an idea the mathins work was done at Functive, I don't have offere the pistons came from. That was all in 1915, before November.

these three ests of pinters

Mr. Brunings : That is all.

Ba Densor Dearmanon by Mr. McCoy.

The piston that Meaninener carried account in his hand he would take the that, take a however earl one how hard he could his if or the top, to show them how much strength the head of that piston had. That was in the same year he put them pistons in that our. He showed Road Chill what their pistons would stend become Road Road Chill what their pistons would stend become Road was just like the roat of us, he disket think they would stend the efficient before he put the pistons in. He took the assumer and his that piston. I remainer it diskingly become he done it so many time. That piston was not split. There were no blots in the skirt will remaine crosswise, access the piston. This one of those hig pistons the size of that and his that with a homeor said one what hoppens.

Total or and his begins the second or all by Manager and Manage

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The administra plateau part is "Many" Jordan's our and in Book Charles our wave not polit. Much of these nots wave plates picture.

Mr. McCoy: That is all.

Dellaw Reserved by Mr. Dentes

I the part committee the health of these part is no picture. I contain it will be out. I contain it will

you how the inside was. I didn't examine the inside of the aluminum pistons. All that I noticed the pistons were awful big through the end of the skirt. I remember they were bigger than the piston we have today.

Monekmeier hit the aluminum piston on the head with a hammer, and it didn't break. I suppose the reason it didn't break was that it had the strength there to keep from breaking. I didn't look on the inside to see what made that strength.

Q. Look on the inside of Exhibit 3.W. What do you think would give strength to a piston of that kind?

Mr. McCoy: Objection, asking for a conclusion of the witness.

A. Well, that piece across the top should give it strength. I mean the rib.

I didn't take the trouble to look inside of the piston to find out what made it so strong. I held it in my hand, I lifted them to see how light they was, took one in one hand, the cast iron in the other, and the cast iron would drop my hand.

Mr. Bruninga. That is all.

(Thereupon, adjournment was taken to Friday

(Therenpon at 9:30 a. m., Friday, March 17, 1933, the hearing was resumed.)

Plaintiffs, being first duly sworn; testified as follows:

DIRECT EXAMINATION by Mr. McCoy.

My name is Jack Henderson. I live in Wheatland, Iowa. I run an automobile repair shop in Wheatland. I have lived in Tipton, Iowa, off and on: I was born and raised there, and then I went to Lowden, in the army in Lowden, and I was out of there for about ten years. The first job I had after I left school was working for Bill Kinney. He was running a garage and repair shop at Tipton, Iowa. I would say I worked for himse couple of years. I running the names of others who were working for Bill Kinney about the same time I was employed there; there was Everett Trucht, Charley Sweet, Fulwiller, and Messkassier off and on, Gus Moschusier, and that is all, I guess. That was Everett Trucht, who was known as "Cappy" Trucht. Fulwiller's first name was beet.

Mr. Monckmeier was a repairman at the garage, worked along with the rest of as. He was also engaged in racing about that time. The races that he attended at the time that I was employed with Bill Kinney were Anamosa, DeWitt, Williamsburg, Central City, and there was others, but I don't just remember them now. I remember the character of ear Mr. Monckmeier drove. It was a six-cylinder Staver, painted white, with the number 9 on the hood. It had a Teeter-Hartley engine. It had yellow wood wheels on it, and some Michelin tires, I believe Michelin tired. It had racing sents, bucket sents. I said the engine was a Teeter-Hartley. I saw that engine down while I was working for Kinney. Those with me at the time I saw that engine down were Sweat, Bill Kinney, Ous Monckmeier, "Cappy" Tracht. The engine was being overhauled when it was down. I took the oil pan off and washed up the parts, and helped lapping the valves a little, grinding them by hand. I did only a part of the valve lapping. The engine was taken apart other than just to grind the valves. The block was taken off, and : I took the oil pan off, and there were rings or pistons or something put in. I don't remember what was put back in it.

I know what came out of the ear by way of pistons. To the best of my recollection, they were a east piston, cast iron. The pistons had holes in them, drilled holes. I seen them in it. They were different from other pistons at that time is why my attention was directed to those drilled holes. Other than being probably interested in trying to get interested in the racing business or anxious to work or something like that, I noticed the difference in them.

There were no alits in those pistons such as you see today in split skirt pistons, or commonly known as split skirt pistons. There were no splits of any kind in those pistons. If took the oil pan off and there were pieces of pistons down in the oil pan when I took it off; they were down in this oil pan. There were pieces out of the skirts of the pistons, and they were mixed in with the oil. If knew from the shape they were in they were from the pistons. I looked up underneath and could see where the pieces came out of the pistons. I saw the pistons again after they took the block off, the pistons were still on the connecting red. I noticed the breakage in those pistons then. They were broken between the holes on the piston; the pieces had fell out.

Comparing the iron piston marked Exhibit 3-V, the pistons that came out of the block were of that type, and holes in them. II do not remember may slots in those pistons. These pistons did not have slots similar to the transverse slot between the besses to which you have di-rected my attention. There were no slots in those pis-tons that I recall. The breakage in those pistons was in the bottom part of the skirt here, pieces came off of this part.

It was about 1915 or 1916 that I was working for Mr. Kinney on the overhanding of the Staver car ewned by Gus Mondander. I cam't place it any closer than 1915 or 1916. It was before the World War, or before

1915 ar 1916. It was before the World War, or before this country offered the War, I mean. If was during the time that the Buropann war was in progress between Bagiand. Germany and France. It was in the summer time, or some kines in those. It was warm weather.

I remarks the purpose of that everthening job. It was to prepare form those or mees. I him (towns for the America, Iron, 1100. The car was afterwards taken to America. It may that became the boys came had with the world. It Make't see the car in America. At that this world. It Make't see the car in America. At that the world. It Make't see the car in America. At that the world. It Make't see the car in America. At that the world. It Make't see the car in America. At that the world. It Make't see the car in America. At that the world it see the car in the abop during to be an America. The Staver car was in the shop traffer the most be been and return.

Line the only Jahl Handerson who was working for Bill Rissey at that these. There is no other Jack Henderson in Tapam that It have of It know of no other Jack Henderson in that neighborhood.

Mr. McCoy: Direct examination closed.

Mr. McCoy: Direct examination closed.

Ches Bratesanos by Mr. Brusings.

Thave seen this piston Ribibit 3-W before today. Isaaw it in Be Mondantier should it to me because he wanted to re-Twent over to Davenport to co him.
If (there i remarker the pictur. When he other pictur.) I the pictur. When he other pictur. I the pictur. When he other pictur. I told him that I think to the in the confinite pictur. I told him that I think to the confinite pictur. I told him that I think to the confinite picture with the picture of the confinite picture. I the confinite picture of the confinite picture. The confinite picture of the confinite picture. The confinite picture of the confinite picture. him Ire

I think I re er later on, br a few days later on, Mr. Monchmeier phoned me in Wheatland at my garage. I don't remember whether it was Sunday or not. Mr. Monekmeier was going to come over to see me with another man on Sunday. I remember Mr. Monekmeier calling, and he came up there later. I don't remember whether that was in the middle of the week or on Friday when I was in Davenport. I remember going to Davenport on other business. I stopped in to see Monekmeier and he showed me this pisten. Then I told him I remembered the concave head on the piston. Then a few days later on, Mr. Monekmeier phoned me, and he had some conversation with me about this piston at that time. I did not say that I would try to fix the date as close as I could when I saw this piston. I didn't say I was going to scrape up my memory and try to get some records as to the date of this piston.

Q. You said you went to war later. Did you say during that conversation on Sunday over the telephone that after you werked at Kinney's garage you went into the army during the world war! A. I don't remember that.

I went into the army. I didn't say I was going to try to place if by the time I went into the army, going to try to place the date when I saw this almainum piston.

Q. Do you remember about the latter part of January some gentleman calling you up and getting you out of bed about ten or eleven o'clock at night at your hotel? A. Yes.

Q. And he mided you what you remembered about this picton whather you had checked up any records; do you remember that, or were you too sleepy! A. Well, he asked me my age for one thing, I remember, and about slotting the picton, and I told him I didn't remember that.

Q. In fact you told him it was so long ago that you couldn't remember anything about it; isn't that right? A. Well, I don't remember whether I told him that in that way or not. I told him I dishi't remember the alotting.

Q. And you said also at that time when you were called up late at night that you had tried to fix dates and tried to remember what you saw back there in Tipton. Iowa, but that you simply conkin't place it at all. Is that just about what you said? A. I don't remember just the exact conversation. It wasn't very long.

I did tell Mr. Monckmeier, when he called me up, that I remembered the aluminum piston he put into the car, as to its having a concave head like Exhibit 3-W. From the conversation in Davenport, I heard it mentioned. I didn't tell him that I remembered the T-slot. I didn't tell him on Sunday that L remembered the Talot. In that late January telephone conversation, when I was called out of bed at my hotel in Wheatland, I said, I didn't remember much about it.

Q. And that is a fact, you don't remember much about it, do you? A. About the slot?

Q. Yes. About the piston. A. No.

In 1915 I was 17 or 16 years old. I was born in 1898, November. That would make me approximately 161/2

years old when I saw this engine in 1915.

I do remember that Mr. C. H. Sweet was there at that time. He was working there. He was mechanic and repairman. He helped in overhanling that engine when it was torn down before that Anamosa race. I don't remember what part he took in overhanling it. I helped grind the valves; I didn't finish the job on them. I wasn't allowed to finish such things. Neither Monek meier nor Tracht ground the valves.

(Short recess taken.)

I think it was just before the Anamosa race that that Monckmeier Staver No. 9 was overhauled in Tipton. Bill Kinney was then the owner of and running that garage in Tipton. I think Bill Kinney helped on overhauling that car. Monekmeier was the owner of the machine; he naturally would have charge of the work. Fulwiler was not one of them at that time. He wasn't there at that time. The people that were there were myself, C. H. Sweet, "Cappy" Tracht, Bill Kinney, and Gus Monckmeier. Some of the other fellows working there ground those valves. I know I lapped them as much as I was permitted. I imagine I had been out of school over a year, I know, when I came over there. I worked the previous year/for Kinney, before this car was overhauled, before this machine was in there. While I was there, Monekmeier's automobile was hauled in there. I had worked there almost a year when that Monekmeier machine was hauled in for the Anamosa race. I started to work there when I was somewhere around 15, between 15 and 16 years old. I was familiar with automobiles

just as a kid trying to learn a little. Some things I learned and some I didn't.

I didn't finish the valves at the time that that car was taken down; I helped on those as a kid helper would. There was a Teeter engine in that car. The pistons were about the same size as Exhibit 3-V, the east iron piston. The diameter of the cylinders was four inches, I guess, or somewheres around there; they might have been 41/2. Looking at Exhibit 3-V, I would say that the diameter of

that piston is around 4".

I took the oil pan off of Monekmeier's ear also. As I recall it, it was an aluminum oil pan. I do not remember what kind of rings that piston had that was taken out of the Monekmeier car. Lam familiar with the Inland ring. I know it is a long lap ring. I know that is an Inland ring on Exhibit 3-V, except that it is broken. That was the only ring at that time that was ever put out with this long lap, that I remember of, that I have any knowledge of. I do not remember whether or not those cast iron pistons that were in the machine when we overhauted it had Inland rings on them. I do not remember whether any Inland rings were put on the pistons that we put into the ear later on. I probably didn't know the name of piston rings then. I would have noticed that distinctive type of the Inland ring at that time, because I didn't see an Inland ring before 1915. It came on the market somewhere around 1914 or 1915.

I said the pistons that were taken out of Monckmeier's car had holes drilled in them. I remember that distinctly. These holes were about of the same character as these holes in Exhibit 3 V, round holes. They looked about the same. I do not know whether the pistons had any oil groove around them that would eaten the oil and let it go back into the piston. I am familiar with the use of an oil groove around the piston in order to let oil run back, to scrape off the oil in order to let the oil get back to the inside of the piston. I didn't notice whether those pistons taken out of the Monckmeier car had such an oil groove; I wouldn't say they didn't; I wouldn't remember that; I wasn't familiar with these things at that time, that is, the groove. The thing that eaught my eyes, on that piston that was taken out of the Monekmeier ear, was the holes in it. I had never seen holes in pistons before. I had never seen slots in pistons before,

I said that one of the pistons was broken or there were pieces of the skirt in the oil pan. These pieces were of cast iron. You could tell by looking at them. I had to flush the pan out. I imagine those pieces would run %", around there, different odd shapes. There were six cylinders in that car and six pistons. That was a sixcylinder Staver No. 9. One piston I know for sure was broken. I don't remember whether any more or not. It wasn't broken up; just pieces out of the skirt, and when I took the pan off, they were in the pan. I wanted to see where they came out of, what they was. The piston was agged, you know, where the pieces would break out. It was somewhere along the lines of Exhibit 3.W. It would be, not just jagged, the edges along. They ran

I didn't take any of those pistons out of the cylininto the holes ders. I just saw them from underneath. I used a light to look underneath. We had an electric light in that garage at that time. I looked in several of the cylinders, I imagine, before I found them there. I looked into the cylinders to see what the pieces were from. I finally located one of the pieces that looked like that, and by simply looking up inside, I could tell one of the pistons simply looking up intid

Some of the other fellows there took the block off. had ragged edges. We had to use a 2 x 4, crossing this old/building, then we had a rope, block and tackle. Had to take the cylinder block off in one piece; it was east all in one piece.

That left the pistons on the rods. I am sure those six cylinders were cast in one block. I don't know who was the one that lifted off the sylinder block; some of those fellows Sweet. I wouldn't may just who took that off of there. Sweet wann't doing the grinding at that time, that was after they had the block off. Sweet did some grinding after the block was off. I ground as much as I knew how to grind. We us two compounds at that time, one course and one fine. Sweet didn't do all of the grinding; Leground come of

I know Sweet was in town yesterday. I didn't see him at all. It has been quite a few years back since I have seen Sweet. Il know Sweet was in town he Cleveland because I was told he was here. Mr. McCoy told me. Mr. McCoy saked me if I know Sweet. That is all be saked me. And I answered yes. Mr. McCoy as me whether I had worked with Sweet in that Tipton garage. That is all he asked me about Sweet. That was yesterday. I waen't in the room yesterday when Sweet was testifying.

After the cylinder block was lifted off of that Monekmejer motor, that left the pistons standing up on the connecting rods, except that they would flop ever to one side or another. I saw those pistons then. Edid not go up to them and examine them carefully. I just took a general look at them. I don't know what happened to those pistons then. They possibly took them out, I imagine. I don't remember that I saw anybody take them off of the connecting rod. I never saw them lay around later on. The looks I had at those pistons, those cast iron pistons, were the looks I had from below with a light and another look that I had while they were standing there on the connecting rods. I don't remember how close I came up to them. II didn't examine them very earefully, just was interested in what the difference was between the pistons of that time and the racing pistons; they looked different and I wanted probably to see what the difference was. I didn't examine them earefully. wouldn't be able to tell you today the details of any of those six pistons other than the cracks or breaks in them. That is all I could tell—one of them had breaks in them. It could be that there might have been a T-slot on one side and with no T-slot on the other side, but I wouldn't remember that, I guess not.

I do not know what kind of pistons were put back into that car. I do not know whether any aluminum pistons were around there. I have never seen Exhibit 3-W

before today.

I said that I remembered a Monekmeier piston with a concave head, because I heard Gus tell me that, you know, when he was tilking about the racing car and talking about the different features it had, and some-thing was a little different. He told me that, I imagine, when I was around there working for Kinney and when he was around there, around town, just a small town. He told me something about aluminum pistons. He told me about the concave held fdea, he explained to me it centered the explosive charge; that is the only thing I remember of there. That was at the time I was at Tipton. I don't remember whether it was the same year as the Anamesa race or not. It was while I was working around Tipton, either with Kinney, or around Tipton some place. I think it was at the time Gus Monskmaier was still running in races. He never told me he had some kind of slot in that piston. I don't remember that. I came here to Cleveland as a witness. I was asked by M. McCore to Cleveland as a witness. I was asked

by Mr. McCoy. He came over there in Wheatland to

(March) or the last of February. Attorney Wells was with Mr. McCoy. He is an attorney in Davenport. I did not know Mr. Wells until he came there. I did not make any written statement at that time. I didn't sign any statement.

I don't know whether Mr. McCoy saw anybody else

about this Monekmeier piston around Wheatland.

I didn't go with Mr. McCoy to see anybody else. I

am being paid for my expenses here and back.

I know the pistons that were taken out of Mr. Monekmeier's car before the Anamosa race were made of east iron. They were made of east iron and had holes in them. I haven't a clear picture in my mind of the fine points of that piston.

Mr. Bruninga: Cross examination closed.

RE-DIRECT EXAMINATION by Mr. McCoy.

Q. Are you sure in your own mind as to whether or not those pistons were split? A. Like Exhibit 3-V?

Q. I am referring to the split underneath the head and the slit along lengthwise of the skirt. A. I don't think they were.

Q. Are you sure whether they were or not? A. No,

I don't behave they were.

The occasion for my visit to Mr. Monekmeier was, he wanted to refresh my memory as to the slots in that piston. He saked me to come to Davenport. I was going down on business anyway, and he told me to come in there in his factory. I went to the factory in Bock Island. That is where I saw Mr. Monekmeier. I afterwards saw him at his home. The occasion for the visit to his home was that he had the pistons there.

No one went with me to Mr. Monckmeier's home, just up to the front there of the house. The girl in the hotel went along down with me to do some ahopping there. She remained in the car because she didn't know them. Mr. Monckmeier didn't say anything about bringing her

into the house.

Mr. Monckmeier's wife came to the door and she left there then. I don't know whether she was in the house; I didn't see her any more, I don't think. No one else was with Mr. Monckmeier. As to where Mr. Monckmeier showed me the pistons, I am not familiar with the different rooms in the house; it was in the house, though, in a little room there in the house,—not in the factory.

When he showed me the piston he asked me if I remembered the piston and the rings and the slot in them, and I said "No, I don't remember them," the slots, only just what he showed me there, and the rings, we talked about that, and the concave head, talked about those—I don't remember. I had a recollection of the piston, though, except for the slots in it.

Pistons were removed from the Monckmeier engine by taking the block off, I believe. I don't think those pistons could be taken out of the base of that car. It required disassembly of all the structure on top to take

the block off.

Mr. McCoy: That is all.

RE-Choes Examination by Mr. Bruninga.

Q. When Mr. McCoy asked you whether you were sure whether the piston you saw out of Monckmeier's car did not have those slots that you see on 3-V, you hesitated a while to think it ever, didn't you? A. Yes.

Q. And really you can't tell now after seventeen years whether those particular pistons may have had slots in them? A. Well, it is quite a long time to remember those things.

Q. Well, wouldn't you swear they did have slots now; would you, from the look you had of them? A. No.

Mr. Bruninga; That is all.

RE-DIRECT EXAMINATION by Mr. McCoy.

I first saw a split skirt piston when I worked for Harter Trady; that was after I was in the army. I recall that piston because it was new, I guess, a new type; something we hadn't had in the shop before. The slots in it, the general make up was new, I guess; being different from the east pistons that run along in those days.

Mr. McCoy: That is all.

Ru-Choos Examination by Mr. Bruninga.

I know that the piston I saw when I worked for Trady had a slotted skirt on it; I don't know just how it was slotted, as to the angle of it. I don't know whether it looked like Exhibit 1. I don't know if it was the same make or type piston as Exhibit CCC. I worked for Trady, and I remember it was a slotted piston, that is all. I don't just remember just how it was alotted—naturally down through the skirt. That is the way I see

them slotted today. That was about 1920, or somewhere around in there. No one tried to sell me a piston at that time, I was working for Trudy; I wasn't buying anything. I happened to see it because we took the ear down that had been in. I didn't do that myself. But this man I worked for run the machining operation. I just took the motor down, and we both worked on the job. We both worked on the pistons. We ground the reds and assembled the pistons back on them and put them back in. In other words, I took out the split pistons, fixed them up, and put them back in.

Q. I am speaking about the first time you saw the split pistons did you take the pistons out of the car;

I think I put then buck in then. I handled them myself in that case. I had a good chance to look at them. I remember they were alit, and they were aluminum pictons; I remember that part. They were not cast iron

Mr. Bruninga: That is all.

The Master: I want this read to the witness, the question and the answer that he gave.

(The upon the following question and answer were read to the witness):

Q. You say you probably, will, do you know that you actually assumed them carefully? A. No, I didn't examine them carefully.

Q. As a matter of face you wouldn't be able to tell me today the details of any of these six pistons? A. Other than the crucks or breaks in them.

Q. That is all you could tell, one of them had breaks in them? A. You.

The Moster: What alld you mann by the "crucks"1

The Witness: The pieces that were broken out.
The Menter: That is all.
Mr. Richey: Now; I think your Honor was going to bring up the question of this evidence. I don't know whether you understand my position or not. I can state it successity. My adversary has affected in artifector account of the File Weappage of offered in evidence a copy of the File Wrapper of the Patent Office, which is just part of the contents, part of the record of the interference, that is Exhibit 4.P; third, he has put in through Mr. Gulick.

portions of the testimony of Mr. Guliek of that record.

The Master: On cross examination, by asking him if he testified so and so, and on such and such

an oceasion.

Mr. Richey: Yes. And fourth, under the rule of this Court of Appeals in Goodbody v. Pirestone, 23 F. (2d) 625, page 626, the Court there refused to reject an afficient regarding the dates of invento reject an afficient regarding tion on the ground that it was fourteen you the the court said to place upon the tarth of an a m years old, and mireto years would in their je

Now, here we have testimony that was taken re-lating to matters going back as far as 1911, and a good part of which is already put in in the regular

seed has mixed up runings: I think o

Mr. Brunings: Nov. to mike the st clear,—I didn't know it was going to be mixed up as much as this,—I would like at this time to make an objection to the offer in evidence of the opinion 67B 67-0 68-0 688 B and C 604 B and C and 70A and B. I had an objection if used as evidence, but if they are going to be used as a lover to get in oridence to support these decisions, that is A different proposition.

Mr. Richey: They weren't used as a lever, but on the basis of what you put in, on the basis that you put in the balance of it.

(Further argument had.)

The Master: I understood yesterday those decisions went in without your objection. Now you

are objecting.

Mr. Bruninga: If the Master rules that my objection comes too late, well and good. I want it clearly understood why I was not opposed to letting the decisions in, if a clear cut distinction is made between the judicial record and the evidence used in making evidence in the case, will and good, because the decision is part of the substantive part of the record, and that is absolutely correct; nobody can

dispute the correctness of decisions.

Mr. Richey: I think we can dispose of that by saying that I don't rely on the decisions I offered in evidence, to justify the acceptance of the balance of this record. It is only because of what you have done. These File Wrappers weren't offered in evidence with any restriction; they were offered for all purposes. It is well established that evidence that is introduced without restriction is available on any issue which it tends to prove and which is within the pleadings. Those File Wrappers not only contain direct references to those interferences, but they contain affidavits in there relating to the queetion of priority. The whole thing is one proceeding about the patent. (Further argument had.)

The Master: As far as this question is con-

The Master: As far as this question is concerned, the earnestness with which it was presented yesterday made me think for a minute perhaps I didn't know anything about rules of evidence. When I went back to study it again last night, I am convinced the rule is that the transcript of the testimony is not admissible. The rule is well stated in Wigmore on Evidence, Sec. 1836, and also stated in Corpus Juris, Vol. 22, page 428: "In order to warrant the acceptance of evidence given at a former trial, it must appear that the parties to the latter trial are either actually or constructively the same, as otherwise the party against whom the evidence is brought could not have the opportunity to cross

examine the witnesses."

There are a number of decisions on that. But it is not material, you know, to have the testimony

there, because the thing that the court is interests in is the decision; and that is what the decision is here in those interference cases, the decisions will be received but the evidence will not be received, and I shall so rule at this time.

Insertual as the other exhibits went in yesterday without objection, I think I shall let them stand and exclude the exhibits offered which are in the nature of transcripts of testimony.

Mr. Brunings: I just wanted a ruling by your Honor in order to save my position.

Mr. Richey: I suppose we may have an ex-

The Master: You may have an exception, cer-

tainly.

(At this point the testimony of Jeffries, Record, pages 914 to 920, was taken.)

MILTON TREETIS, a witness called by Plaintiffs in rebuttal, being first duly sworp, testified as follows:

Dinnor Examination by Mr. McCoy.

My name is Milton Tibbetts; I reside at Detroit, Michigan; I am 63 years old. I am Vice President and patent council for the Packard Motor Car Company, Detroit. I have been in the employ of that company since 1907, first as manager of the patent department, then as patent counsel, later as patent counsel, assistant secretary; later as patent counsel, assistant secretary and assistant vice president; and now as vice president and assistant secretary-patent counsel.

I have known Edward J. (called since 1908 or 1909.

About 1915 or perhaps 1913 or 1914, Gallek brought

suit against the Packard Company under one of his patents. This suit was later settled, I think about in 1915, or 716, and shortly after that I had some business dealings with him concerning the purchase of some patents

and inventions of his.

. I think it was the year 1916 or thereabouts that Mr. Guliek brought to me his unlit skirt piston invention, to-gether with several other inventions and several of his patents, with the suggestion that I might want to purchase them for the Packard Company, II am not sure whether Mr. Gulick told me of this particular invention before, because I have discussed Gulick's inventions with him, or had discussed them prior to that time, on so many

eventions I used to see him in econocities with the other superinties. That is just possible be may have shown it is not before this, but I think that at that time, is the winter of '16 or early apring, he showed me liberprints of drawings of I and that can be fined by a letter of athetasticity that date, a letter that I wrote to Gulick. There was a mathematical accompandence from these or regarding the inventions and potents. The appointment of a superint of some meaning as I recall it was from the early spring of 1916 until the enumer of 1917.

The letters marked Plaintiffs' Rabilitie II to 17, inclusive, are the letters conclitating the correspondence referred to be my last answer, that is, the earlies letters are explaint of my letters to Ouliek and the original letters are letters from Guliek to me or to the Packard Company. These particular letters over taken from my files over the age. I produced them for the commit in this case of he case other case. That was at the time the tensor to be against taken in Detroit in connection with

Exhibits of each of each of one the three prints to found to in any letter of Month So in the face diamental states of the print of the each of the face of the contract of the face of the contract of the face o

These exhibits, Plaintiffs' Exhibits 36, 37, 31 and 32, were used by me in the preparation of a patent applica-

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tion which was filed on this invention later on. These exhibits were hapt in my office files until removed for the purpose of use as exhibits in the interferences referred

to previously.

As near as I can remember, this Plaintille' Exhibit 36, which you have just handed me, is exactly in the same condition as it was at the time I received it, except for some additional markings, such as the words "Gulick Exhibit," and words to that effect. There is a notary's name on the back and a No. 1 on the front, and the stamp of the United States Patent Office in 1928. Otherwise there seems to be nothing different from what I had be-fore me at the time in 1916.

Except for the Patent Office and exhibits markings thereon, Plaintiffs' Exhibit 37 seems to be the identical paper as was before me in 1916.

g to the black duk writing in the the blugging Plaintiffs' Babilit H T a also on th on the p

tion shown in the as in August, 1917.

as doubt as to whether Gulick I all of the at so that it could be handled et or all of the or hortly aft or my letter of March 27, 1916. I exactly how long after, but it was very shortly thereafter. I would say a few days, as I recall it, but I am not certain on that. It was no appreciable time because I wanted to get the matter cleaned up.

During these negotiations there was no change whatever in the attitude of the Packard Company regarding the acquiring of title to these inventions relating to the piston. We did our best to complete the transaction and apparently Gulick was doing his best, judging from the letters and the telephone calls, and so forth, that I had from him, and that his attorneys had with our counsel in Chicago.

Mr. Bruninga: Objected to as a conclusion of the witness, founded upon hearsay.

The Master: Same ruling.

(Narrative continued) Mr. Gulick explained to me at the March, 1916, conference that some of these pattents were eward by the Simplex Company or the Amplex Company, one was a successor of the other, in Mishawaks, or South Bend, Indians, I have forgotten which came first and which later, but he was connected with both companies, because that company that owned that at that time was in the hands of a receiver or was in bankruptey and he was endeavoring to get the patents back in his own name so that he could assign them to me; and that was the trouble he was having and was the cause of the delay over several months time.

Mr. Brunings: Again objected to as hearsny.

I can't say exactly how frequently Mr. Guliek got in touch with me during that period, but I just recall that he had written me on several occasions, had called me on several occasions. I had met him in Chicago once or twice while I was over there on other matters, in an endeavor to get this fixed up. The recollection that is in my mind of the whole matter is that it was a continuous performance, we were trying to buy all the time and he was trying to sell, trying at least to get the title so that he could complete the transaction which was started in March.

All of these patents and inventions that we were trying to purchase were in one group, and during the period one or two patents would be withdrawn because he couldn't get them, and a new proposition would be made, and he had some other inventions, as I recall it, and perhaps one or two other patents, and a different price was agreed on, all of the prices around \$3,000, however, and, finally, the patents and inventions that he could get were lumped together and sold along in Au-

gust, as I say, of 1917; but during all of this period the split skirt piston of paragraph marked 2 of my letter of

March 27, 1916, was included in the group.

The arrangement was that the Packard Company was to file and pay for the application for patent on this piston invention, and Mr. Gulick was to sign such papers as were necessary for those applications and for the prosecution of the application. The Packard Company finally filed this application in November, 1917, I believe. That also is of record. The Packard Company was to pay the expense and did so. Let me add to that: I might say up to the time the Packard Company disposed of the application to the assignee.

I am not sure that the date of letter, Plaintiffs' Exhibit 52, namely, March 25, 1916, was the first time that Mr. Guliek disclosed the split skirt piston, as shown in Plaintiffs' Exhibits 36, 37 and 32, to me, as he may have discussed this with me on previous occasions, but I can definitely fix that date by reason of my letter of March 27, which letter was dictated March 25, as shown by the

letter itself.

I cannot say positively whether or not I had any conferences with Mr. Galick regarding his split skirt piston prior to the date of that letter, because I discussed to many inventions with him that I just don't know. I certainly would not testify that I had not because it is quite

possible that we discussed this before.

The conference I had with Mr. Gulick in Detroit regarding this matter was either on the day or the day before I dictated that letter, Plaintiffs' Exhibit 52; I think probably it was the day before, that is, March 24. I think we should here make it clear that this letter which we have sometimes referred to as March 27, 1916, was dictated on March 25, 1916. I would say that the conference occurred on March 24 or March 25, without question.

I cannot recall the exact date I started to prepare the application for patent on the split skirt piston shown in these exhibits, but I can remember that there were many things that prevented our doing it immediately, and the principal thing was the World War, which started in April of 1917. Immediately thereafter, as the Court will probably take judicial notice, Col. Vincent, who was then our chief engineer, was called to Washington to work with several other engineers in the designing of the Liberty engine. They were all down there in

the Willard Hotel over a period of several months, and the Packard factory was working feveriably to produce the parts for it. This meant that all of us were devoting a very large part of our time, both the engineering department and the patent department, to that particular matter, and some other things had to wait. This was one of the factors delaying our work through that spring and summer. But even at that I was able to file the application in November, 1917, after our purchase in August.

This Gulick patent 1.815,733, Plaintiffs' Exhibit 2, is a copy of the patent that issued on the application which I filed on behalf of the Packard Motor Car Company in November 1917, on the split skirt piston shown and described in Plaintiffs' Exhibits 32.86 and 37.

I cannot at this time recall anything in connection with this invention between March 24, 1916 and the date of filing the application for patent on the application, beyond the negotiations for the purchase of the invention and the filing of the application.

Mr. McCoy: Direct examination closed.

Choes Examination by Mr. Bruninga.

As to what offices, officiale of patent counsel, I held in the Packard Company from the beginning of 1916 until 1994, and the dates of the different offices (referring to memorandum), I can't recall the dates. I have given you the sequence in my answer to one of the early questions on direct examination. If you want to know what other offices I have held in subsidiary companies of the Packard Company, I can give you several of them, if they have any pertinence. The subsidiary companies were Packard Motor Car Company of New York, Packard Motor of Chicago, Philadelphia, Dallas, Texas, Packard Motor Export, Packard Motor Sales, of all of which I am assistant secretary.

If can't recall whether I was assistant secretary as early as 1916, at the time of the negotiations, or not, but I think I was assistant. I was patent counsel, which is not an office perhaps. I can't recall when I first was made assistant secretary; I can't even remember whether it was before or after the war, that is what I was trying to connect up with, but I cannot. I cannot remember when I was appointed assistant secretary. If thought some of these letters would show, but they would not show that because they were very seldom signed as as-

sistant secretary, it was more an office as a matter of convenience more than anything else. I am quite sure I was assistant secretary at least before 1922. I may have been assistant vice president, but I am not sure of the exact date of that, either.

If the Patent Office drawings marked A4 and A5, respectively, referred to in my letter of March 27, 1916, are not here as exhibits I cannot identify them, but I assume they are just what they say they are there, drawings made for filing in the Patent Office. They undoubtedly related to the slide valve motor. I do not know whether or not they illustrated any piston.

I testified in Interferences 49,569, 49,570 and 49,571.

I have not seen the sketch and the description, Exhibits 36 and 37, since I testified air years ago, or thereabouts, in those interferences you just referred to.

I didn't road Exhibit No. 37 over entirely while I was testifying a few moments ago, I simply testified from the appearance of it, and of course I couldn't recall it during that period of years anyway, that wouldn't do

me any good to read it over. It looks the same.

I haven't examined Exhibit 32 recently. As I say, I haven't examined it since that testimony in the interferences, but I know the construction of the piston which I saw, which I filed the application on in 1917, and I am morally certain that this is the same blueprint because it has not been changed. This is also true of Plaintiffs' Exhibit 36.

As I recall it. Gulick would not sell any individual invention or patent without selling all of them. His mind was bent on selling the group, and as I recall it, one of his letters referred to selling them in a group. I amnot sure that Mr. Gulisk's hands weren't tied as far as this particular piston was concerned. He may have had some arrangement with the defunct Amplex Company which may have prevented him from assigning those, but that am not sure of . I don't know what he had in mind in wanting to sell them as a group, but I know that was true. I don't recall that I asked him to deliver that one application over to me. No particular reason why I should. There was no more reason why I should pick on that application than any others, and if he wanted to sell them in a group, there wasn't any way I could get away from it. If it was dangerous to delay in the filing of an application in one case it would be dangerous in another, as far as that was concerned.

The Packard Company was anxious to acquire that particular piston as well as the others in the group. I don't know that we had any particular desire for any one of them any more than any one of the others.

The assignment provided for successive assessment of \$200 for each patent which was not delivered. I thought one of the patents was valued at \$100 and another at \$200. In fact, there were two of them valued

at \$100, and two of them at \$200 each.

I don't recall that I tried to acquire this particular application at a certain price without waiting for the title on the others, and I don't know that it would have made any difference, because the group was what he was trying to sell. It is my recollection that he was bound in trying to sell me the whole thing or nothing. I don't recall that he told me he was entirely free on the piston application as far as being tied to any other company was concerned. I would say it was the inability of Mr. Gulick to get the title from the defunct company that prevented the closing of the transaction. Gulick held up the transaction on his own account. I cannot speak only for Packard as far as knowledge roes, but I have pretty good knowledge of this also because I was in so much of it. I did not know that Mr. Onlick did not have a thing tied up on this.

So far as that particular application is concerned, the Packard Company in my opinion, and as I see it, didn't hold up the transaction of securing an assignment of the application, and I don't know whether Gulick did or not as far as that particular application was con-

cerned.

The filing of the application after August, 1917, was delayed on account of the United States going into the war and Col. Vincent being appointed as the head of a corps of engineers to design the Liberty Motor; that was one of the factors contributing to the delay, which was not a very long delay. Our patent department was not put out of business so far as filing applications was concerned, between April 8, 1917, and November 30, 1917, because it may be we filed applications during that time, I am not sure; the patent department always had to work with the engineering department, and both departments were extremely busy at that time with various things connected with the Liberty Motor order.

I can't say positively how many men we had in our patent department from April 8, 1917 to November 30,

1917. I had Mr. Declittle part of that time; Mr. Hawley, I think a part of that time; I can't remember just when

they came and went.

I am not at all sure there were any applications for patent filed during the interval between April 8th and November 30, 1917 by the Packard Company; there may have been. On the other hand, when we were working on Liberty Engines I had to go back from Dayton to Detroit, and Washington to Detroit, and see the Colonel in connection with various matters while he was away from the office.

I wouldn't call that a simple application, but I can't tell you what applications were filed and when, but you can find that of record for that matter. I can't say how long it took to prepare the application of which we are speaking; I don't suppose it would take a week. I would say it would take more than a day, or it would have in 1917. I might go faster now. It is true that I have been practicing since 1907, and I wasn't new at the patent application business at all in 1917. I have spent a week almost continuously in drawing two or three claims, and so have you; whether I did it in this case or not I can't say and I wen't. I can't say without records whether or not any other applications were prepared by the Packard Company between the 1st of August, 1917, and November 15th, 1917.

The piaton of that application was not suitable for an airplane motor to be built as the Liberty Engine was to be built. It had to be built on tried things, tried elements, and that is what Vincent was putting into it. He was putting into it the work that the Packard Company had done for the previous four or five years on airplane engines and anything that was as new as this could never have been put into that engine. I think an aluminum piston was put in there, but not this type. I think it was a solid piston, because it was a six-inch piston; I don't think this type would go in there, anyway, not in that engine. It was too new, they hadn't had experience with it. I don't know if it was desirable to have a split piston in the

Liberty Engine; I doubt it.

I know that Exhibit 2 is a patent which issued on that application, from the drawing, date of filing, and the name Gulick and the assignment of Packard to the Cleveland Trust Company, my signature on the drawing, or a facsimile of it, and everything else about it that looks like it. After the application was assigned to the Cleveland Trust Company I was advised from time to

time of the progress of the proceention of that application; I was not sent copies of all the amendments but some of them. I base my conclusion that that is the patent that issued on the application on account of the serial number and filing date and on account of my name on the drawing, which I think is sufficient for me or anyone else to testify to.

I am not sure who prepared the application, but I think I did. If I had some of the original papers here, the file and the application. I could be lived from that.

(Witness refers to the file wraper and contents of the Gulick application.) I filed it. I prepared it. My initials "M. T." are at the bottom of page 2 of the original specification. In order to prepare that application I had before me the blueprint, Plaintiffs' Exhibit 32, the pencil drawing. Plaintiffs' Exhibit 36, and descriptive matter, Plaintiffs' Exhibit 37, and considerable conversation with Mr. Gulick, the substance of which conversation I cannot give you at this time. That conversation supplemented the disclosures of Exhibits 32, 36 and 37, since it was a description of the print and drawing and his reasons for thinking it was a better piston than some others, and matters of that sort that any inventor talks about. If think he gave me the reasons why he thought it was a better piston; I can't remember the reasons. If don't know whether I incorporated those reasons in the application but I assume I put enough in there to make a good application out of it; that was the custom, at least partly so. I did not incorporate in that application all partly so. I did not incorporate in that application all the things that I found in Erhibits 32, 26 and 37, and what Mr. Gulick gave me, because it is not necessarily the thing to do. Some things should be put in and some should not be in an application. It den't recall what I left out of the application. It couldn't put everything in that the inventor take me because there wouldn't be room in the Patent Office. It has been my experience with a great many inventors that they are wordy. Mr. Gulick went on considerable about his invention, carried on a good deal. It don't recall this particular matter. but I good deal. I don't recall this particular piston, but I do know that Mr. Guliek talked a good deal about his inventions and thought a good deal of them, as any good inventor does, and I have no doubt he talked about this invention.

I put into that application all I considered of importance at that time, from the disclosures he made to me. I don't recall how long before I prepared that application I had a conference with Mr. Gulick, nor my last conference with him.

Upon looking through the file wrapper and contents of the Gulick application, I note on pages 10 to 13, inclusive, an amendment received by the Patent Office July 28, 1919. It was apparently filed by my assistant at that time, Mr. H. P. Doolittle. Mr. Doolittle signed that amendment; either I signed it myself or Mr. Doolittle or someone else signed it for me with my approval. In those days it was sometimes my practice to look over an amendment made by an assistant, and sometimes not. I cannot recollect whether I looked over that particular amendment.

The next amendment dated by the Patent Office September 25, 1920, pages 15 to 18, inclusive, was apparently prepared by another of my assistants, Mr. L. W. Haw ley, I believe. I don't remember whether I looked that amendment over or not, but I do know that I signed if personally. Amendment dated by the Patent Office October 31, 1921, pages 21 to 23, inclusive, was apparently prepared by me and it was signed by me. In nearly every case where my initials are used at the bottom of an amendment, as in this case, the amendment was wholly prepared by me. There have been cases where amendments have been prepared by my assistants and I have perhaps rewritten them or had them rewritten by my stenographer, in which case the stenographer might put my initials at the bottom of them, but certainly I had something to do with the amendment and probably the most to do with it if my initials appear at the bottom.

The amendment received by the Patent Office December 24, 1921, pages 24 to 26, inclusive, was also prepared by me and signed by me, with the same reservation as I

have stated in answer to the previous question.

I don't know who prepared the affidavit on pages 27 and 28. There are no initials on it. For the reason that I refer to it in my amendment on page 26, I prepared it, though this particular affidavit is more or less of a form affidavit and I may have had my secretary prepare it. Maybe I am wrong; this is an affidavit under Rule 75; I thought it was a supplemental outh and now that I see it is an affidavit swearing back of a reference, it was undoubtedly prepared by myself or one of my assistants because it was necessary to get the data before preparing the affidavit.

The amendment received by the Patent Office September 12, 1922, running from pages 32 to 42, inclusive. While it was undoubtedly signed by me because I was

the attorney of record at that time, I do not know by whom it was prepared. There are no initials to indicate that it was prepared in my office, though it is possible it may have been.

The amendment received by the Patent Office March 20, 1923, pages 45 to 49, inclusive, was signed by me, but

I do not know who prepared it.

The supplemental oath, pages 50 and 51, I can't say

who prepared.

The amendment dated April 17, 1923, pages 54 and 55, was signed by me and has my initials appearing on it. It is probable that I prepared it.

The associate power of attorney filed June 29, 1923, page 90, was signed by me, thus giving associate power

of attorney to Watson, Coit, Morse & Grindle.

The amendment of April 7, 1931, pages 104 to 122, inclusive, was apparently prepared in Mr. McCoy's office, he having been substituted as attorney in the case.

I cannot tell, without studying this case for some time, why the supplemental amendment of December 24, 1921, 1 ages 24 to 26, was filed. I certainly have no recollection of it today. One of the reasons for filing the supplemental oath or the affidavit under Rule 75 seems to have been to antedate the Schoengarth patent, whose application was filed in October, 1915, and which patent is mentioned on page 26 of the file wrapper and contents.

As to the statement in the affidavit, page 27: "That said invention was incorporated in an automobile engine and successfully operated in the United States prior to the month of October, 1915," I do not know where that date was obtained, but I suppose it was from Mr. Gulick or from the affidavit. I may have had some correspondence on that point, or I may have gotten it by the telephone, I do not know at this time. I have no recollection of it at all, except that I think it was on the blueprint, the Buria date was somewhere in 1915, as I remember it. The Buda date was on the blueprint, too.

Q. That refers to the incorporation of that invention in an automobile engine and was in successful operation in the United States prior to the month of October, 1915, which is prior to the date of Iling of the application of the Schoengarth patent? A. So I must have gotten the information from Mr. Gulick

I can't remember whether or not I have any correspondence on that point. Of course I have none of my

files here.

Q. Will you look in your files and let me know?

Mr. McCoy: Objection. The matter is immaterial, subsequent to the filing of the application, and asking for heareny. No testimony has been given heretofore regarding the files that Mr. Tibbetts happens to maintain at his office.

The Master: What do you claim for it, Mr. Bruninga? What do you claim for an answer to

this question?

Mr. Braninga: Why, it is apparent there is some inconsistent statement in this oath. It is claimed that the invention was incorporated in an automobile engine and successfully operated in the United States prior to the month of October, 1915. and reference is had to a drawing which Mr. Gulick has admitted was never reduced to practice at all, and I believe I am entitled to obtain what data Mr. Tibbetts, or one of his associates, had to enable them to sign that affidavit, and that is particularly true since counsel wants to rely on this affidavit as establishing conclusively, they say, a certain date. It is very important now to connect that up with what was done. Mr. Gulick said the particular construction which is attached as a print was never reduced to practice at all, was never successfully operated.

The Master: I think he may answer the question. Whether the files would be admissible, would be a question for the Master to consider when the answer was taken.

Mr. McCoy: This affidavit was not by Mr. Tib-

betts, this affidavit was by Mr. Gulick.

The Master: You may answer the question. The Witness: I will, if the Court so orders.

Q. Well, I will ask you to look; and the question, after you have looked, I think the question will be whether there will be further investigation, there will be further inquiry; that is the way to dispose of it at this time.

Mr. Richey: I want to point out counsel makes the witness his own in direct examination on it. And furthermore, the purpose is to impeach an affidavit which he has brought in here. I think the matter is disposed of for the time being.

Q. Do you think you could phone your office and have them trace that matter so that you don't have to

go back and look yourself? I don't want to make it any trouble for you. A. The Gulick file papers are there are a lot of them. I don't know how I would tell my secretary to go at looking for that particular thing. There are a great many papers in there. That might be contained in the papers which I have in that particular application file, and I haven't all of them because some of them were probably turned over to Mr. McCoy's office when the application went over to him. On the other hand, it might be in some of the other general Guliek files, of which I have several. So that I doubt if my secretary could find it; certainly she couldn't make a thorough search in the short time you want to have it made. I can have her make an effort if somebody will pay for it. I might add, your Honor, that our force is cut like every other law force. I am down to little or nothing, and my secretary hasn't time to do anything unless she is paid for it.

The Master: I will assume whatever expense she is put to it will be necessary for her to be paid for.

Mr. Brunings: This man is produced as a witness. He apparently comes here without any records whatsoever. Counsel knew pretty well what he was going to be examined on. One of the defences in this case has been that this application has been amended. There have been things take place during the prosecution of this application that are contrary to law. I don't mean to cast any reflection on counsel. They are not in accordance with the law at all. Counsel was advised pretty well on what this man was to be examined on, he apparently comes here, not through any fault of his, without any records whatsoever.

Mr. Richey: He was preduced here to show diligence in connection with the Gulick work prior to the filing of the application. All this examination regarding this application here and undertaking to impeach the affidavit he has put in, is entirely outside of the examination in chief.

The Master: I don't think that is quite the situation. He is called here as a witness by you and he testifies as to this application having been filed, and these proceedings have resulted as part of that. I think it is proper cross examination at this time. If it is necessary for this witness to ex-

amine his files and come back here and testify as to this, I think probably the defendant is entitled to it, without the question of expense; that is something that I think the parties will have to decide between themselves.

Mr. Bruninga: This witness has not been called upon simply to show diligence; he has identified cer-

taih drawings here.

The Master: I understand.

Mr. Bruninga: And they have brought in the question of priority and I want to check that matter up.

The Master: I understand that. I think I un-

derstand the situation.

The Witness: Your Honor, may I, for my personal privilege, make a statement at this point?

The Master: Certainly.

The Witness: Since Mr. Brunings has evidently tried to impeach this affidavit, or the honesty of the man who drafted it, I want to say, if the affidavit was prepared in my office, and I don't know whether it was or not, as I have told him already, the facts were certainly obtained before I asked Mr. Gulick to sign the affidavit; if that is the way it was done. On the other hand, the affidavit might have been sent to Gulick in rough form and Mr. Gulick may himself have put the dates in and rewritten the affidavit before signing. I can't testify as to that. But I do want to say that the whole thing may not be in my file at all.

The Master: Certainly. I think you should examine your file and if necessary come here again to answer this question, because it seems to me that is one of the vital points of this case. I may be wrong

about that.

Mr. Richey: What is that?

The Master: The question as to this date and this affidavit.

Mr. Bruninga: Your Honor will remember Mr. Gulick testified he didn't remember whether there was correspondence, and that all his papers were burned up, and I asked Mr. Gulick—

The Master: I understand that. He said the affidavit came to him and he went before a notary in Elkhart, wherever it is, and signed it and sent it on to some body, as I recollect the testimony.

(Narrative continued) As to the amendment filed in the Patent Office September 12, 1922, and included in pages 32 to 42 of the file wrapper and contents, I cannot tell whether I prepared that amendment or not. The fact that there was an assignment of the application to the Cleveland Trust Company on September 11, 1922, does not help me in determining whether I prepared that amendment, because the amendment may still have been prepared in my office, or it may have been prepared by counsel for the Cleveland Trust Company at that time. As to the amendment on page 50, preceding the supplemental oath, filed in the Patent Office March 20, 1923, and included between pages 45 and 49 of the file wrapper and contents, I can't say whether or not that amendment was prepared in my office. I do know that the amendment was signed by me. I do not know whether or not I personally went over it and approved it; neither can I tell whether I personally went over and approved the amendment of September 12, 1922, pages 32 to 42. I can't remember having a conference with Mr. Gulick after the filing of the application, but my recollection is that I did see him after that, but I am not positive. I can't remember having seen him shortly before or shortly after the application was assigned to the Cleveland Trust Company. I do remember the occasion of the assignment of the application to the Cleveland Trust Company.

Q. You at least were called in on conferences preceding that assignment, weren't you, to determine the

advisability of assigning?

Mr. McCoy: Objection. This is entirely outside of the prima facie case, and our direct examination had nothing to do with the assignment of this application to the Cleveland Trust Company.

The Master: He is not asking him for anything, just whether he took part in such conferences or whether he knew about it. I think he may answer

that question.

Mr. McCoy: What is your purpose? Does it have anything to do with the direct examination of

this witness?

Mr. Bruninga: Well, one thing, we are trying to refresh his memory. This man has apparently prepared a lot of affidavits; he needs something to stir up his memory on some of these points.

Mr. McCoy: That is your only purpose?

Mr. Bruninga: That is my purpose. I am trying to connect it up.

The Master: He may answer and you may have your exception.

(Narrative continued) I was in on several conferences, of course, preceding that assignment, because I was the one who negotiated the sale of the application. to the Cleveland Trust Company. That doesn't help me at all in determining whether I had any conferences with Mr. Gulick immediately before or after the assignment was considered. I have a hazy recollection of having conferred with Mr. Gulick. It was not at all necessary to, because he was not a party to the assignment or sale.

I didn't know there was any delay in prosecuting that application after it was filed. The filing of the amendments just within the legal period is not a delay, if they were filed then; I don't know if they were; I suppose they were. I don't know that there was any delay. As I said before, if you will point out some delay, I will try to explain it. As I say, I don't know of any delay that occurred at all after the filing of the application, becapee certainly five months and 28 days is not a delay. I assume there was a reason for waiting five months and 28 days before amending that application, or we wouldn't have done it. I cannot give any reason.

I know of no reason why the amendments to the specification were filed October 21, 1921 and December 24, 1921 rather than earlier. There wasn't any delay.

That part of the question is impertment.

Q. Well, you are not passing on the pertinency, now; you happen to be a lawyer before the Court, and he is passing on the pertinency of these questions, Mr. Tibbetts.

Mr. Richey: Well, he is familiar with the statutes, that is the reason he is trying to advise you. Ask him how much delay, what the statute requires.

Mr. Bruninga: You can re-direct him; he don't

need any coaching.

(Narrative continued) I haven't looked at the claims of the amendment of October 31, 1921, pages 20 to 26, inclusive. If your Honor please, I am in no position to give an opinion to Mr. Bruninga on the subject of claims in this application of several years ago. It will require not only a reading of these claims but an examination of the prior art and a full examination of the application

Q. I am asking you whether you understand the scope of those claims;

Mr. Richey: We object to the extention as being improper. It is not the function of the witness to be

terpret the claims, anyway.

Mr. Bruninga: This is just preliminary to another question, because I said I have to make it very plain to this witness or he becomes counsel in the case and objects to the question.

The Master: Is there a question now?

(Question read by reporter.)

(Narrative continued) At this time I do not under-

stand the scope of those claims.

I can't recall the Schoengarth patent; I didn't know the name was in the file. I don't remember the occasion of filing an affidavit to antedate it. I certainly cannot tell you why claims of the scope of those two amendments weren't put into the application before they were put in on those dates.

At this time I have no idea why claims 14 to 28, in the amendment of September 22, 1922, pages 32 to 42, inclusive, were filed nearly five years after the appli-

estion was filed, rather than earlier.

I remember there was a Long patent involved somewhere, but whether it was Long patent 1,395,441 or not, I don't know.

I remember there was a Hartog-Pomeroy interference, but I thought that came after I was out of the case. The interference appears in the amendment of September 22, 1922, which was signed by me, from the statement as to the Hartog-Pomeroy interference. That may be because I may have been informed of it. I remember there was a Hartog-Pomeroy interference, but that is all, but what pertinence it had here I don't know now. I probably did at that time. I don't know whether I knew about the Hartog-Pomeroy interference when I signed that amendment, because I don't know whether I prepared the amendment or not. I was the attorney of record, and I signed that amendment, if this is a correct copy of it I have before me.

I assume that is a certified copy of the file wrapper and contents of the Patent Office. This looks like it, and

I would say yes, but if I am testifying to prove this document, I would say no, because I don't know whether that seal was put on there at the Patent Office or not. I am

not disputing it.

I wouldn't say I have corefully refrained from looking into this case or anything connected with it before I came here, because that has nothing to do with it but I did look into those parts of this case upon which Mr. McCoy said he expected to examine me. He told me he expected to examine me in connection with the time, from the time this was brought to my attention until the application was filed, including the delays in filing the application, if there were delays.

Q. Well, time expired in filing the application, from the time that Mr. Gulick started to negotiate with you, until the time that the application was filed, you under-

stood! A. What time expired?

Q. Until the filing of the application. The time, the period from March, 1916, to November, 1917, if that means anything to you? A. It doesn't. I didn't know anything had expired in that time. I don't know what you mean.

Q. The time that had passed, you were asked to pre-

pare on that? A. Yes, between those dates.

Q. And give any excuse for failure to file the appli-

cation? A. If you call it that, yes.

Q. But you didn't go any further than that? A. It wasn't necessary as far as I knew, and that is as far as I went.

Mr. Richey: I think it is absolutely immaterial.
Of course we will do everything we can. Mr. McCoy
will look his files through and Mr. Tibbetts his.

(Thereupon, the witness was excused to Tuesday morning of the following week.)

9:30 A. M.)

(At this point the testimony of Jeffries, Record pages 920 to 996, was taken.)

Thereupon, at 1:30 P. M., Tuesday, March 21, 1933, Minros Timerre, being recalled as a witness, further testified as follows:

FURTHER CROSS EXAMINATION by Mr. Brunings.

I find I wrote Mr. Gulick a letter at the time the application was prepared and forwarded the application to

Mr. Gulick with the letter. I have that letter with me. If the Court orders me to let you see it, I will—it is a privileged communication between myself and client. I think I shall stand on that,

The Master: Of course I can't order him, if it is

a privileged communication, I suppose.

Mr. Bruninga: No, there has been a distinction between a patent solicitor and a patent lawyer. This

is a matter of a patent solicitor.

The Master: If the fuling of the District Court is, if you can show me some authority so that this witness can be called upon to produce it, I will consider it. When I made the first statement I assumed the general rule applied.

(Narrative continued) I prepared the application for Mr. Gulick, acted as his attorney. I considered myself as attorney for Mr. Gulick in the preparation of the application. He hadn't given me a formal power of attorney then, but the formal power of attorney was signed at the time the application was signed. At that time there was no application of the Gulick patent in suit. Mr. Gulick himself negotiated with the Packard Company; which negotiations culminated in the Packard Company acquiring the application of the patent in suit. He was represented part of the time by Mr. Pond, if you consider all of the negotiations. I did not think I was representing Gulick in part of those negotiations. I would expect that my position as attorney for Gulick began at the time I began the preparation of the application for him to sign. To that extent I was his attorney, which was after the negotiations. I base that on the relationship of the parties at that time.

The application was to be prepared by me, that being part of the agreement between Galick and the Packar! Company, and I did prepare the application and I sent it to him for signature. Among the papers was the power of attorney which was signed by him at the time the application papers were signed, and along with that was an assignment issued to the Packard Motor Company; and that was signed on the same day that he signed the power of attorney; and that immediately divested himself of all legal right, title and interest in the application, the day that he signed my power of attorney. As a matter of fact, I was representing both the Packard Mctor Company and Mr. Gulick in the preparation of that application, I would say, because the Pack-

ard Motor Car Company had an interest in it. It is quite usual for patent solicitors and patent lawyers, particularly when acting as solicitors, to include the power of attorney with petitions, and I did this; and, of course, I have done that with all of the applications that I have filed for employees or parties who signed applications for the Packard Motor Company; it is the usual custom. I have done that for years. I don't know whether you would say I was 'retained' by the applicant in all of those cases, but I consider myself his attorney.

Q. Who gave the power of attorney to Mr. Gehr in

this case? A. What power of attorney?

Q. The power of attorney to Mr. Gehr, I see was given by Cleveland Trust, and the same is true of power of attorney of Mr. McCoy in that application. It wasn't necessary to join Mr. Gulick in that, was it? A. I don't know.

Q. You don't know; you don't know the law on that,

do you! A. I don't know that I see why-

Q. You don't even know the Patent Office practice. You know well enough that the Patent Office recognizes the power given by an assignee, don't you? A. That is

usually the case.

Q. Well, you know as a matter of fact, as distinguished from law, that the Patent Office recognizes a power of attorney given an attorney by an assignee of an application? A. I think the assignee of all the interest, yes, it is my recollection.

Q. Where did you find that letter that you don't

want to produce in your own file?

(Narrative continued) I found that letter in the file of the Packard Company with that particular application, with the patent drawings. I did not find it in Mr. McCoy's files, but in the files of the Packard Company.

When I testified in this case I didn't make any reservations at all as to my conversations with Mr. Gulick. I don't think I took advantage of the privilege of an attorney when Mr. McCoy asked me mestions about Gulick's disclosures to me or Gulick's conversations with me; I don't know of any particular reason why I should.

I know that Packard Motor Company, of which I am an officer, owns a certificate of interest in Cleveland Trust

Company, the owner of the Gulfek patent.

Mr. McCoy: That is going completely outside of the direct examination.

The Master: Oh, that is all in here. He is an officer of the company. It may be preliminary. The answer may stand and you may have your exception.

(Narrative continued) I can't recall whether I saw the amendment appearing on pages 10 to 15 of the file wrapper and contents before it was sent to the Patent Office. I think I have answered that question before, and I can't answer any better now than I did then.

Q. In order to refresh your recollection I want to call your attention to the fact that both of these amendments differentiate from the Schoengarth patent I,174,092, a copy of which I hand you, and a copy of which you need not read, but have you seen that patent before?

A. I probably have seen it.

(Narrative continued) As I told you several days ago when I was here, I had no recollection of the Schoengarth putent than. I have seen the putent since then. I have a faint recollection of having seen a putent that looked like that, but I have seen lots of patents since.

I am a member of the bar of the Supreme Court of the District of Columbia, the Court of Appeals of the District of Columbia, and the Supreme Court of the United States.

I can't recall whether I have ever had my cases in Washington in the District of Columbia, or not. My occupation has been that of a colicitor of patents, and partly as an executive of the Packard Motor Company. Outside of that it has primarily been that of colicitor of patents.

(Short recent taken.)

I was admitted to practice before the Patent Office before 1917. That is going back a long ways. Just a minute—I think about 1905. I was admitted to the bar in 1903 and I was admitted to practice before the Patent Office either that year or before. Of course I know that a colicitor before the Patent Office does not have to be a member of the bar.

Q. Now, I want to get alearly before the Master the relation between yourself and Mr. Guliek. Now, Mr. Pond conducted the negotiations on behalf of Mr. Guliek, at least up to the time of May 18, 1917, as indicated by the letter in evidence from Guliek to yourself? A. You are showing me a printed copy of an interference testimony.

Q. Well, you can have the letter before you. I thought you would remember. A. I think that is substantially correct. I certainly wouldn't dispute it.

Q. Well, you had that letter before you when you testified a little while ago. It, mention, "I trust you will give this abject matter your early attention and advise Mr. Po.d accordingly, that the subject matter may be properly closed up." Up to May 8, 1917, Mr. Pond was still representing Mr. Gulick! A. I think Mr. Pond represented Mr. Gulick during those negotiations for the purchase of this inventions and putents that the Packard Company purchased from Gulick in 1917.

(Narrative continued) My recollection is that the purchase of the Ordick applications, indicated in the March 17, 1916 letter, was completed in August, 1917. Between that date and November, 1917, when the application was filed, I prepared the application for Ordick to file in the Patent Office. At that time I was supplyed by the Packard Motor Company, on a subgry. I was giving my exclusive that to the Patented Motor Company. I want taking in any cuttide patent business for remuneration, and I wasn't doing my free for friends, that I recall. I can't say whather or not I took out any application for anybody except for or on behalf of the Packard Motor Company, during 1917, because I don't recall any. I don't recall may applications which I had taken out one or two years on either tide of 1917 for or on behalf of mybody she than the Packard Motor Company, but I know I have prepared and filed applications for others during my supply next by the Packard Company, for friends and others, practically all without remuneration, some few with.

I don't remember having said that I put a week on the preparation of this application for Mr. Guitel, but I think probably I did. During that time I drew my pay from the Packard Company, for the packard of this application for Mr. Guitel, but I think probably I did. During that time I drew my pay from the Packard Company.

on the preparation of this application for Mr. Guitel, but I think probably I did. During that time I drew my pay from the Pathard Company. The Pathard Company as assigned, through me had control of the Guitel matter, this Guitel application, during that period on account of the axisting quatract. I sent the application and the assignment to Mr. Guitel, to sign and be uncuted the application, including the power of attorney and the assignment, on the same day. The application name is shoot universally put on the drawing, and I think was in this instance. It was in this in-account can be seen from the enlargement which Plaintiffs' com-

sel has produced, which satisfies me the name, Mr. Gulick's name, was placed on that drawing. It is generally done even though the application is on the same day assigned to an assignee; I don't think that controls at all. It is a matter of custom for the applicant to appoint an attorney, not a matter of convenience.

Q. It is a matter of custom, it don't establish any relation of attorney and client between the applicant and the attorney who prepares the application in behalf and for the assignee, does it? A. I can't answer that. It think that is a matter of law. I would say that it did.

Q. But you have never considered yourself as an attorney for any of those applicants, have you, after it was assigned to the Packard Company! A. I considered myself an attorney for all of them, undoubtedly attorney of record in the Patent Office.

Q. And you would have taken care of Mr. Gulick's interest adverse to the Packard Motor Company on account of the appointment by power of attorney! A. They weren't adverse.

Q. But if a situation would have arisen where Mr. Guliek would have refused to execute that assignment, you would still have filed the application and proceeded?

Mr. Richey: The plaintiff is on the side lines in this matter, but we have a right to object to building up a lot of record here.

The Master: I think not. This man has refused to produce this letter, and he is being inquired concerning it. You have produced this witness and it seems to me it is proper cross examination.

A. That is a moot question which I can't answer. I don't know what I would have done at that time, but I might add if he would not have signed the application I couldn't have proceeded with it.

(Narrative continued) Of course I could have proceeded with the application if Guliek had signed the application but had not signed the assignment. I don't know whether I would have gone on with it in that event.

My relations with the Packard Company, of course, were such that I could have proceeded with the Gulick application, filed it in the Patent Office, and represented him adversely to Packard Motor Company. I don't know what I would have done in that respect. I can't answer that yes or no, either way; I don't see why I could not.

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Q. You have stated on direct examination that after a period of time covering the negotiations and so forth, and disclosures of Mr. Gulick, that you proceeded with the filing of the application, that the matter was delayed on account of the Liberty Motor design, and that you finally sent the application to Mr. Gulick to sign. You testified to that on direct examination? A. Yes.

Q. But now you take the position that the letter of transmittal of the application is a privileged communication, is that right? A. I think it is and I don't see any

reason why I should show it to you.

Mr. Bruninga: I am ready to have the Master rule on it.

(Thereupon, argument was had by counsel for the respective parties; counsel for plaintiffs citing decision of the Supreme Court of the United States in Chicac et al. vs. Reinicker, decided in 1826 reported in Wheaton, Vol. 11, page 278, at page 477.)

The Master: If the witness wants to insist still further on this privilege, I will take a little more time and examine the question to satisfy myself.

The Witness: May I say I would like to have you do that. I will say that for this reason, if I may do so, I came down here voluntarily as a witness connected with the interim, the time between the beginning of these negotiations and the fling of the application. I think I have responded, both to cross examination and direct, on that, but from that point on, where the defendants' counsel has saked me to go into my records on matters that don't concern in any way that time interval, I just don't like to release my privilege, that is all.

(Further argument had by countel, counsel for defendants citing Jones on Buidesce, Third Edition, page 1165, and case thereunder 128 U.S. 464.)

The Witness: Before you make a raling, may I make a statement?

The Master: Certainly.

The Witness: In this particular matter at that time, at the time in question, in the fall of 1917, I was counsel for both Guliek and for the Packard Motor Car Company. I am still counsel for the Packard Motor Car Company. These files belong to the Packard Motor Car Company. This particular communication that is in controversy here is, as

you know by having read it (the witness having previously shown it to the Court), not of a great deal of importance in all probability, but if your ruling is that this must be produced here and shown to defendants' counsel, it will mean also that the other communications will have to be produced, presumably, and in many of them there are references made by Guliek and by me to other patents, other inventions which have nothing to do with this case, and which I do not want, and I don't believe Guliek would want, spread on the records of the Court, where they become public, and I can't see why I should divulge this evidence, these communications, without the consent of Guliak and without the consent of the Packard Company; and on behalf of the Packard Company, as an officer, I will not give the consent

Mr. Bruninga: I want to say right here I don't want may communications as to any other inventions except this one. I have no desire or that at all, but answering Mr. Tibbetta, there is another proposition: the Court can pass upon the matter piece meal. For instance, if this particular letter is

proper to be received, the Court can then determine whether the others can be received, in succession, that is the way I understand it.

The Master: Well, is I hallow, on such examination now as I have been able to make. Mr. Brunings, the rule of practice is that this communication should not be received unless there is a waiver, as Wigmore way, on bahalf of the client. Now, the client in this case is either Guich or the Packard Motor Car Company. I have not either this moment determining which it is a Birt Jones states the Packard Motor Car Company. It am not at this mo-ment identifying which it is. If it Jones states the rule in this way, in this edition that I have, sec-tion 400, "For the privilege to exist it is unflictent that communication has been made by the client to his legal advisor for the purpose of professional aid with respect to matters in which such aid may be properly given and in respect to which litigation may properly arise." Now, further, this seems to be borne out by some examination in the short time I have had as I have been able to make of Wigmore, and the discussion of this appears in Section 2823 in this edition which I have before me, and which covers a page or two and is to the same effect as covers a page or two and is to the the rule stated in a few words in Jones. /And in

view of the case we have before us, this Brunnager vs. Swith, which limited it to solicitors. I don't feel that at this time I could permit the admission of the document, of the letter. If, on further examination before this trial is over, you can find other authorities and want to present the question again," I will be mind to entertain it, but at this time I will sustain the witness in this refusal to produce this letter.

Mr. Bruninga: Your Honor understands, of course, this witness is an officer of the Packard Motor Company who passed title to the patent in suit.

The Master: I understand that, and this witness quas sacting in part for such Packard Motor Company, as its attorney, in preparing the application, too, I think, although the application was signed by Gulick himself.

Mr. Brunings: I sadmit he was acting on be-

half of the Packard Motor Company.

The Master: So we will jet it stand there at this time. If you find other authorities you want to present I will be glad to entertain them.

Mr. Brunings: Of course this is one case where I cannot make an offer under the equity rule because I don't know what the evidence is going to be. Your Honor will grant me an exception in this CDOC.

The Master: Yes, you may have it.

(Narrative continued) I have known Mr. Gulick since about 1906 or 1909. I don't think I have been his attorney in any other case prior to that time. I don't recall his ever talking me about a piston in 1908 or 1909. I learned about the particular piston in Exhibits 36 and 37, the original description and the sketch some time before my letter of March 27, 1916. If can't say how long before, because as I have stated before Mr. Guliek has discussed with me, and all through that time discussed with me, a great many of his inventions; whether he discussed this one or not. Lidon't know.

Q. It believe you stated on direct examination that Mr. Gulick's idea of the negotiation and the closing of the negotiation was that he wanted to sell all of his inventions or nothing; in other words he didn't want to split them up, so much for each one? A. All of that

ยชย์ให้สอบ พ.ศ. เรื่อยที่โดยที่ได้เลื่อได้เลื่อนต้องเลืองกล

group, yes.

Q. Now, turn to page 131 of the record in the interference proceedings in which you testified, and near the end of page 131 you testified as follows: "Shortly after that March agreement was made it turned out that Gulick was unable to get title to these patents and consequently he could not go through with the agreement. Later he was able to get some of the patents and not others, wid he was able to get some additional patents that had been owned by the Amplex Company, and he made a revised offer of sale to us. As I recall it, there were still additional changes in the line-up of patents and inventions made from time to time as the negotiations regressed and as the receivership or bankruptey proceedings of the Amplex Company were carried on, but always this piaton invention of the blueprints, pencil drawing and description referred to in my previous answers were a part of the subject matter involved." The reference is to the exhibits which are now 31, 32, 36 and 37. What did you mean there by "he made a revised offer of sale to us'!! A. As he found that one or two patents couldn't be obtained from the receivers or whoever it was that owned them, he made a group offer omitting these, and in other cases he was able to add some patents that he was able to get hold of or expected to, he added these to the grow.

(Narrative continued) Mr. Gulick was compelled to make a revision of the contract by reason of the fact he couldn't get all of those patents in one group. He was

apparently willing to do that.

I don't think I could have gotten this piston application alone in March, April or May of 1916, because he wanted to sell all of them together, as many of them as he could get. I think the language in my testimony in the interference indicates that he wanted to stick to the whole or nothing. He was compelled to take some of them out because he couldn't get them. He still wanted to sell all of them.

Beferring to page 801, which contains the letter of December 24, 1916, which is in evidence, (witness comparing numbers) the letter of December 24, 1916 included the four patents referred to in the letter of March 27, 1916, and it also included five other patents. It is my recollection that those were additional patents to the matter in the agreement of March 27, 1916. Apparently Mr. Guliek was able to carry out his delivery of the patents and applications mentioned in the letter of

March 27, 1916, as it stood as of December 4, 1916; but here also he says that he prefers to dispose of all of them, which simply carried out what I have stated before. He says he preferred to; he doesn't say he insisted upon it, because he has added five additional patents, five other patents. As far as that agreement of March 27, 1916, is concerned, I would say that Mr. Gulick was ready on December 4, 1916 to deliver title, excepting that he doesn't mention the invention referred to in the letter of March 27, 1916, although he refers to the letter itself. I know of nothing that prevented Mr. Gulick from delivering the slide valve motor and the motor piston and the double-acting air cooled motor piston, mentioned in the letter of March 27, 1916; I think his intention was to include all of them in this offer of December 4, 1916.

Referring to page 303, the letter of May 18, 1917, Mr. Gulick had been in somewhat of a hurry all along up to that time to close up the matter. The delay between December 4, 1916, and May 18, 1917, was caused because it took some time for us to get together, which we did in February, 1917, in Chicago, according to my letter of February 28, 1917, which is on page 302. And apparently we were then waiting for Mr. Rector to approve the title, and that I remember quite well. Mr. Rector and Mr. Pond were working on the title papers to see whether Gulick would deliver a good title to all

I don't remember whether Gulick was right when he said on May 18, 1917, "I believe the assignments are all straight"; they were right later. The matter wasn't actually closed up until August. In other words, it took from December 4, 1916, to August, 1917, to get the matter.

the patents and applications involved.

from December 4, 1916, to August, 1917, to get the matter concluded. It was a matter of about eight months between December, 1916, and August, 1917, but a number of things were done, as my letters that I have referred to explain, and as I have explained, the matter of getting title fixed up, it wasn't a delay without action, if that is

what you mean.

I know that the matter of title was not straightened up at the time I received that letter of December 4, 1916. I don't know whether he was able to deliver title or not, but the title had not been approved by Mr. Rector, and therefore it was incomplete so far as I was concerned.

I admit there was a period of almost a year, between December 4, 1916, when Mr. Gulick stated he was ready to deliver title, until November 30, 1917, when the appli-

cation was filed in the Patent Office, but I don't say it is unexplainable, because as I have explained to von several times, and I think on direct examination also, there were a good many things that had to be cleaned up. The receiverships, which Mr. Galick has referred to, and which I referred to which the letter referred to, made a very complicated title, took a long time to do it, and it took some time for Mr. Rector to act on it. Mr. Rector was extremely busy, as Mr. Qulick points out in his letter. I see no necessity for further explanation on the delay during the period of one year in closing up the title and filing the application.

I don't know what period I had in mind when I testified in the interference, page 133 of the record, as

follows:

"Shortly after the consummation of the purchase of the piston invention and the other inventions and the patents involved, a file was made in my office and this case with others was before me for preparation of the application. Shortly thereafter the application was prepared, the drawings made, and the papers sent to Mr. Gulick for execution. They were returned by him and filed in the Patent Office. All of this was in the fall of 1917."

I don't know whether or not I traveled book and forth to Washington between August and November, 1917. I don't think Mr. Vincent had returned to D in June, 1917, but he may have. He went back and forth a good deal.

I don't know whether the first Liberty or

built as early as the fell of 1917 or not.

When I i testified, on page 134 of the record of the interference: "During that summer and fall the first experimental Liberty Engines were built by the Packard Company and all of as here were working feveriably to get those first engines built," my recollection seems to have been better then than it is today. When I said "here" Inneant Detroit. I was not necessarily in Detroit. all of the summer and fall of 1917. My headquarters were always at the Packard Company at Detroit during that period.

I have not looked up how many patent applications the Packard Company filed between August and Novem-

ber, 1917. I never thought of it.

Mr. Bruninga: I would like to have the privi-, lege, then, of filing copies of such patents as I may

be able to find whose filing dates are between August and the 1st of November 1917

The Master: By whom!

Mr. Bruninga: By the Packard Motor Company. If I can obtain them from the record.

Mr. Richey: File a list of them, it will be just

as well.

13:

Mr. Bruninga: Yes, if you are satisfied with the list, Mr. Richey.

Mr. Richey: All right, no need to chatter up the record with a lot of patents.

The Master: Such document will be received.

(Narrative continued) I stated that the Packard Company was a holder of a certificate of interest in the trust estate. As an officer of the company I am interested in upholding the Gulick patent. I am a stockholder of Packard. The records show that that application of the Gulick patent in suit was assigned to Cleveland Trust Company on September 11, 1922. It don't remember the exact length of time over which those negotiations extended, but it was some months. I was instrumental in making that deal.

It is difficult for me to say whether I approached the Cleveland Trust Company or the Cleveland Trust Company approached me in that deal, because I can't recall just how it came up. My recollection is that it first came up through an attorney for one of the parties to the subsequently formed trust, and after that I can't remember whether I approached the Cleveland Trust Company or

the Cleveland Trust Company approached me.

When II prepared that application for the Gulick patent in unit, I will tare that likeney the piston art, or that Lido new. If had seen some patents on pistons and prepared and drafted applications for some patents on pistons, but that is a long way from knowing the piston

I don't know whether or not I prepared the application for the Vincent patent 1,279,184. It was prepared in my office.

Q. You put into that application all of the disclosures Mr. Galick gave you into the Gulick application of the patent in suit. I mean?

Mr. Richey: It seems to me we went over this the other day. We are repeating the same ground and therefore immeterial

The Master: He may answer.

The Witness: I put in as much as I thought belonged in a patent application.

(Narrative continued) I don't remember whether or not I told Mr. Doolittle, my assistant, what Mr. Gulick had disclosed to me, to enable him to prepare amendments. Neither do I remember telling Mr. Hanley what Mr. Gulick had disclosed to me. The presumption is that I told him enough to prepare the amendment on it.

Q. I notice that by looking at the file wrapper and contents that there was a delay between the first office action, or rather the supplement to the first office action and the first amendment of approximately nine and a half months; that there was a delay between the first official letter and the second amendment of approximately ten and a half months; then there was a delay of about eleven and a half months between the official letter of November 19, 1920, and the amendment of October 31, 1921, but that there was then sudden activity on December 24, 1921, as shown by page 24 of the file wrapper and contents, there was a supplemental amendment filed, adding additional claims, and the supplemental oath. Can you explain that sudden activity? A. No and I don't know that it needs explanation particularly.

Q. You may not think it needs explanation. A.

Right.

Q. But your answer is that you don't know what the

sudden activity was? A. I don't recall it now.

Q. I notice that the amendment of October 31, 1921, is actually dated in your office November 29, 1921, and that the supplemental oath is dated December 2, 1921. Also that the Long patent 1,395,441 issued on November 1, 1921. Was the issue of the Long patent on November 1, 1921, any reason for that sudden activity? A. It is quite possible that it was, but I don't recall it.

(Narrative continued) I doubt very much if I ever

had seen one of the Long pistons at that time.

There are a lot of things tried out experimentally in the Packard cars. I do not keep track of outside matters of that sort in connection with experimental work. Sometimes I see them, sometimes I don't. I don't recall the Long piston at that time. I have seen the Long patent 1,395,441, but not necessarily at that time.

I can't recall now who prepared the amendment of September 12, 1922, although I know that I signed it.

Q. The Patent Office records show and the exhibits in this case also show that in a certain interference of Hartog vs. Pomeroy, involving an application of Aluminum Company of America, the final hearing was set for January 10, 1922. On February 17, 1922, there was a decision of the Examiner of Interferences in favor of the Aluminum Company of America's applicant, Mr. Pomeroy, and on August 30, 1922, there was a decision of the Board of Appeals reversing the Examiner of Interferences, in favor of Mr. Hartog and against the applicant Pomeroy of Aluminum Company of America. Do you have any information as to that at all, having in mind that the amendment of September 12, 1922 was prepared about 13 days thereafter, and the assignment to the Cleveland Trust Company is dated about 12 days thereafter? A. I don't recall any of that.

Q. Well, as a matter of fact, the records show, the file wrapper and contents show, however, that on October 31, 1921, the time that the amendment was filed in the Patent Office as indicated by page 20 of the file wrapper and contents, you took personal charge of the application after it had been previously prosecuted by Mr. Doolittle and Mr. Hawley. Can you explain that? A. If it needs explanation, yes. I did as I frequently do in cases, if I want to pick up and amend, I do so, if I want somebody else to amend it, I ask them to do so, depending on how the work stands in our office and whether or not I am particularly interested in this, that or the other case.

(Narrative continued) I know Mr. Gunn very well, but I don't remember his article in Automotive Industries of January 29, 1920, which on page 363 disclosed the Long piston; I may have seen it but I non't remember it. I may have known about the pendency of the Long-Hartog interference, and the Hartog-Pomeroy interference. I am saying I do not remember those things now. At the time I may have been cognizant of a number of these things. I may have seen the Long patent as it came out. I tried to follow the Gazette as it comes along, but I can't remember anything about that patent except that I have seen it from time to time.

At the time the amendments of October 31, 1921 and December 24, 1921 were prepared, I don't know whether or not I was familiar with the piston being used in the Maxwell car of the character shown in the Maynard patent 1,655,968; I may have seen it. I may have seen it

in the magazine, if it was in there, if the patent had issued. But I have seen so many pistons and piston patents that I certainly cannot remember that particular one.

Referring to the supplemental outh dated December 2, 1921, which is on page 21 of the file wrapper and contents, and particularly to the statement "said invention was incorporated in an automobile engine and successfully operated in the United States prior to the month of October, 1915," I found that I had some correspondence with Gulick, and in that correspondence I found statements by him from which I prepared this allidavit, and then I sent it on to him and he executed it. I have that correspondence here with me, but I am not willing to produce it; it contains several matters outside of the pistons. I doubt very much if I could cover up that portion of the letter which relates to other matters.

Q. I want you to understand, Mr. Tibbetts, that I do not want any confidential invention between Mr. Qulick and Packard Motor Company outside of this piston, and if there is any way you can arrange to take out of that letter before the Master, or let the Master do it under your direction, parts which do not relate to this piston, I will gladly accede to it. A. I think I will have to take the position that the entire communication is a privileged one.

Q. Including this matter of what evidence you have

relating to, that the investion was incorporated in an automobile? A. I think that is particularly privileged, yes. The alkdavit speaks for itself.

Q. The alkdavit does not speak for itself, Mr. Tib-

yes. The allidavit does not spank for itself, Mr. Tibbetts, that is just your own personal opinion. It indicates that a piston of the construction above in that biseprint has been used in an argine which Mr. Gulick now approximate the probably your opinion.

Q. And I cross examined Mr. Gulick about it and he said he didn't stand on any privilege, which counsel or the Master can tell you, still you stand on privilege and don't want to communicate anything? A. Yes.

Q. And is spite of the fact that Period Motor Communicate anything? A. Yes.

Q. And in spite of the fact that Packard Motor Company is a predecessor in title to the Guliek application in

suit! A. Yes.

Q. And in spite of the fact that the Packard Motor Company owns 700 shares in the trust estate? A. I am not sure of the number of shares.

Q. But it owns a substantial number, does it not?

A. Not verv.

Q. Well, the records of the Court of it show it owns 700 shares. But you still stand on privileged communication! A. Yes.

Q. In other words, you don't care to be checked up, do you, even as to the matter relating to the Gulisk piston? A. If it can be called that, but those are your words and not mine.

Q. Did you have any knowledge of the so-called 1911 and 1914 pistons of Mr. Guliek at the time that this affidavit was prepared? A. You mean personal knowledge; of course, I didn't.

Q. Did you have any information at the time it was prepared? A. Information as to what?

Q. As to the character of unposed Guliek 1911 and 1914 pistons? A. I certainly had inscribedge of what I assume you refer to as the 1914 piston, because that is

the date of the blueprist which Mr. Galish left with me in March of 1916, but as to what you mean by the 1911 piston, I haven't followed the te identify that.

Q. Well, I will ask you this question: Is the web piston shown in Exhibits 36 and 32—these are the original sketch and the bineprint—is the web piston construction, is that the only type piston that was disclosed to you by Mr. Gulick? A. Oh, no, Mr. Gulick showed me a number of pistons, a number of different types of pistons.

Q. A number of different types of pistons? A. Yes.

(Narrative continued) I, of course, mean that Mr. Gulick showed me the drawings of the pistons. I don't recall if they were actual drawings or aktiches; probably both. It recall one in particular beamse I happened to see it when I was looking over some of these other pispers the other day. It saw a bineprint of one of his pistons, which had nothing to do with this, but merely answering your question, I say I saw it. It has since been patented, and the patent as I understand it has been purchased by the Trust. It don't know the number of it. I could give you a description of it, if that will help you say. It is the piston of patent 1,337,538.

If don't recall new whether or not Mr. Galick disclosed my piston outside of the particular one shown in the Gulick patent 1,515,733, prior to the time of the filing of the application in suit; he may have, because as I say he talked with me about so many of his inventions, if he had any others, he probably showed them to me. I don't

know whether he disclosed a piston to me that didn't have the wrist pin bosses on webs, like 17 and 18; he may have.

I don't know whether you would call, what Mr. Guliek told me before I prepared that affidavit of December 2. 1921, disclosures, but he told me he had made a piston of that claim prior to October, 1915, I think the date was, the date referred to in the affidavit, which was the date of filing of the application of the Schoengarth patent 1,170,-092. I never took occasion to find out if Mr. Schoengarth probably had constructed anything previous to the filing date of that application. Of some of the things I have very good recollection because I have refreshed it from the files themselves, and on these things of whether they are the same or similar to a lot of other applications, it necessarily is faint. My memory has been refreshed on the amendments I have filed and the facts I prepared the application itself, and those are the initials on it. My memory was so fresh on Exhibits 36 and 37, the original sketch and description, that all I did was look at it and say, yes, that is what I saw, because I have seen them a great many times and I testified about them before. That is also true of Exhibit 32

Q. But when it comes to the matter of an amendment involving important claims, you don't have any recollection of that? A. Because some of them I had nothing to do with except to sign them.

Q. Even though you signed, your memory is faint

on that? A. I don't recall any such amendment.

Q. You don't recall any amendment you prepared; your memory isn't very fresh on that? A. I think so. I think I testified fairly well as to those particular amendments.

(Narrative continued) You may call my memory refreshed, but not fresh. I came here at the request of plaintiffs, and it was not necessary to subposens me.

Mr. Bruninga: Cross examination closed.

RE-DIRECT EXAMINATION by Mr. McCov.

Mr. Brunings: I understand you won't rule on the production of these letters different than you have?

The Master; It will be the same roling at this

time.

Mr. Bruninga: How will the matter work out?

The Mester: I said if you had anything further to submit and satisfied me that the rule was otherwise than I have indicated, before the case is closed, I will permit you to recall this witness.

Mr. Brunings: In other words, he is still sub-

ject to call before the Court?

The Master: Yes.

Mr. Bruninga: So I understood.

(Narrative coatinued) The only explanation I can give of the time interval that transpired between the receipt by my office of the actions from the United States Patent Office and the filing of the several amendments that have been caned to my attention, is that it was done in the usual course of business. There was certainly no undue delay. Most cases at that time would run from eight to ten or eleven months before we amended. That was quite the usual thing at that time in the office, when we had the number of cases we did in the office. When we were up to date at that time it even took six months, even if we would catch up. Even at this time it is four or four and a half months. That is quite the usual thing with my office as it is with everyope else's.

Mr. McCoy: That is all.

(At this point the testimony of Jeffries, Record pages 999 to 1027, was taken.)

(At 1:30 P. M., Wednesday, March 22, 1933, the following proceedings were had:)

(Thereupon, the defendants called as a witness, out of order, in surrebuttal, Walles L. Schonneauth, who, being first duly sworn, testified as follows:)

DIRECT EXAMENATION by Mr. Brunings.

My name is Walter Schoengarth. I now live in Chicago, and before that I lived in Ironwood, Michigan. I came to Ironwood in the manmer of 1912. I was born in 1885. I was in Ironwood, Michigan, very nearly all my time from 1912 until I moved to Chicago; I moved once to Hurley, Wisconsin, which is about a mile from Ironwood, just across the boundary line, and then back to Ironwood. I instempted to Chicago a week or so are

I just moved to Chicago a week or so ago.

When I came to Ironwood, I started in automobile repairing work, for Harry Barr. He ran a garage, and his business was automobile repairing and selling machines. He first sold the Ford and then the Cadillac.

and the Overland. He handled Fords right from the start

My work there was repairing cars, and finally I got to be foreman shortly after I come there. I stayed with Mr. Barr until he sold out to Gale. I am not certain as to when that was; I think it was possibly in the early part of 1917; it may have been in the fall of 1916.

My experience previous to working for Mr. Barr, which qualified me to repair automobiles, was:—I did some stationary repairing on gasoline engines and had quite a bit of experience on steam engines, locomotive at one and stationary engines, and ran a locomotive at one

time.

I became familiar with pistons before I went to work for Mr. Barr. That experience involved taking out, re-pairing and replacing pistons in automobile and station ary gast engines; I wouldn't say that included the Ford car so much. I did some of this work after I came with Barr

I am the Walter Behoengarth who took out the Schoengarth patent 1,174,092, and that patent was granted to me. The attorneys who assisted me in securing that patent were Louis Bagger & Company, as shown on the drawing of that patent.

Previous to that patent, that concern assisted me in

During the last month I have had some correspondence with that patent concern. I wrote in for some literature or information with reference to that patent 1.174. 092, and they went me home.

Q. I want to will your attention to a letter, original letter dated May 4, 1915, addressed to Louis Bagger & Oo., and signed Walter L. Schoongarth, which I will mark for identification as Defendants Exhibit 5-E1; do you recognish that detter? A. Yes, sir.

Mr. Richey: Before you ask any more questions.
I would like to repeat my objections that this is not set up in the answer, and make an objection it is not proper surrebuttal testimony.
The Master: Same value on that.

know Mr. Watta who is in the room I imagine I met him probably a month ago at my none. He came over there to see if he could get some information with regard to the patent that I had received. I had a com-plete conversation with him, and I talked freely with him. I did not try to hold anything back. I also talked

with Charley Garland and Edmond Stenstron, and another gentleman there. I couldn't say what date that WAS.

Mr. Bruninga: Is Mr. Watts willing to tell me what date that was!

Mr. Watts: Well I would if I could. I can tell it by looking it up.

Mr. Richey: February 15th, wasn't it?

Mr. Watts: No. Pebruary 16th, of this year.

(Narrative continued) Another gentleman with with him. I do not know the man's name.

Mr. Bishey: A. E. Redner, superintendent of the fronwood Mine.

(Narrative continued) That was before you (indicating Mr. Bruniaga) ever met me. You had, however, had a long distance telephone conversation with me.

I recognize Exhibit 5 Kl as a letter I wrote on the day I have it dated marked May 4, 1915. That letter reads as follows:

"Flindead find \$5.00 for first examination on invention which I call the adjustable piston. I am sending you model by express. Hoping it will be all O.K., I remain, yours truly, Walter M. Schoengarth."

I presume the model referred to in that letter was I presume the model referred to in that letter was sent by American Express. It do not know where it is now. That model was constructed just like the constructions shown in the Schoengarth patent 1.174,002. The one that I contivers a swooden model, and I made it because I understood you had to make models with patent drawings in occ. The "202 Friderick Street" was the place that I resided at that time. The posteript reading, "You will also find shotch and write up on the same" was put on after I wrote that letter. Such a shotch was sent.

Lunade that tracing, Differential Exhibit 5-K2. I was able to make drawings in these days. I dearned that when I worked as a rod man and transit man on the Soo Line, about 1917 to 1921. I thinked that drawing. I

Line, about 1917:40 2921. I finished that drawing, I presume, the day I made the date there is May 7. 1915

That three page description, marked Defendants' Exhibit 5-K3, is in my handwriting. There read that description recently, and it refers to this drawing 5-K2, I sent the drawing, or sketch, 5-K2 in a few days later than I wrote the letter of May 4, 1915; I must have held this letter for a few days until I had this drawing completed. The sketch 5-K2 and write-up 5-K3 are the ones referred to in the postscript of that letter.

Mr. Louis Bagger sent those three papers, 5-K1,

5-K2 and 5-K3, to me recently, at my request,

I remember receiving a letter, a carbon copy of which is attached to 5 K1, dated May 13, 1915, and which is marked for identification "Defendants" Exhibit 5 K4." I do not know where the original is, but I remember the contents of the letter.

The letter dated May 20, 1915, and marked "Defendants' Exhibit 5-K5" is in my handwriting. That letter states:

"Enclosed find \$20.00 for preparation of pa-

That \$20.00 mentioned was the \$20.00 asked for in Bagger & Company's letter of May 13, 1915, Exhibit 5-K4. I wrote that letter 5-K5 on the date thereof.

I remember receiving the original of the letter marked "Defendants" Exhibit 5-K6," which letter asked for \$20.00. I do not know where the original of that letter is.

I wrote the letter dated July 29, 1914, which should be '15—I made a mistake. This letter is marked "Defendants' Exhibit 5 K7." That letter is in my handwriting, and it couldn't have been written in 1914. It have made mistakes in dates occasionally, and I suppose I made that error thereo.

I remember receiving the original of the letter dated August 5, 1915, and marked "Defendants" Exhibit 5-K8," which refers to my letter of the 29th ult., which is 29th of July, 1915. It am quite sure the date on 5-K7 should

have been 1915.

(Short recess taken.)

That is my handwriting on the certified copy of the petition, certificate, oath and drawing as originally filed, of the application which matured into Schoengarth patent 1,174,092 (Defendants' Exhibit 5-K9). That is my handwriting above the oath and at the bottom of the oath.

That oath is dated the 27th day of July, 1915, and my letter of transmittal in which I sent the Post Office

money order for \$35.00 has the date of July 29, 1914. That latter date should have been 15. That letter states:

"Enclosed find Post Office money order for \$35.00 for patent execution on adjustable piston, also rough drawing showing adjustment. You need not change reading of execution papers only show in drawing that abutment is threaded to stud, also to end; the lug has a plain drilled hole; otherwise, O.K., am well pleased. Hoping to hear from you soon, I remain.

That adjustment I referred to in that letter is the one shown on the little sheet attached to the larger sketch. They didn't get that clear on this large sheet here, said I showed them again this was supposed to be threaded into that been and a plain hele drilled through here. The stude were supposed to be threaded into the piston. The lugs with the stude threaded through were larger; they were free so they would alide through there.

The part sketch drawing is the one marked August

5, 1915, on Exhibit 5-K2.

Mr. Bruninga: I offer in ovidence Defendants' Erhibits 5-K1, 5-K2, 5-K3, 5-K4, 5-K5, 5-K6, 5-K7; 5-K8 and 5-K9.

Mr. Bithey: Indofar as they state facts which have not been proven otherwise than by the letters, we object to them as containing heareny. The Master: They may be received with the

(Narrative continued) Charley Garland and I made that wooden model, light I referred to in my letter of May 4, 1915, Exhibit G.K.I. I remember that model. I made an actual modal picton of the character as shown in the patent 1,174,092, at the shop where I worked at Ironwood, in the spring of 1916. That was some time before the letter of May 4, 1915, transmitting that wooden model. As I stated before, the reason I made that model was because I thought it accessery to have a model for the Patent Office, to obtain a patent.

We made up four of those metal pictons for a model T Ford truck, owned by Sallivan & Gambe, who ran a grocery store. Mr. Cambe is dead, but Mr. Sallivan is still living. These pictons were no different from the picton shown in my patent 1,174,092, except that we left out that adjustment in the pin; that could be either with or without; that had nothing to do with this, it was just a or without; that had nothing to do with this, it was just a

straight ordinary brase bushing. We dish to thange the wrist pin bearing at all; we used this adjustable arrangement abown in Fig. 4 of the drawing. We need a Ford cast iron piston of standard dimensions, and widded the bosses in with an electric wilding torth—or acceptene wilding torth, rather. We wilded on the boss D and the boss F. We then drilled right through both the lug F and the boss D, and threaded the boss D. I drilled a hole through the skirt at the bottom and at the top. At the top I wilded on the lug C, and also the lug E. Then I bored right straight through. I also made a tap hole in the boss D. straight ordinary brass bushing. We didn't change the

We serowed the belts 5, in Fig. 5, in w make that larger upper hiot 3

We were paid for the labor and time we put in making those pistons. It was in the spring of 1915 when we put the first set in. That was before I first wrote Bagger & Company on May 22, 1915. Bagger & Con

Charles Garland, who helped me with that job, is at Ironwood, Michigan. It talled with him recently over the phone. I know it was him because I know his voice, er called, and I talked with him pers Theard his not in good health at present.

(Q. What did he sall you?

withten for and a beat who

Mr. Richey: Lobject to that as hearsay.

Mr. Brunings: Oh, no, that is not bearsey. I am trying to excuse why this witness isn't here.

The Master: I don't think you can do it by

hearsay. He can tell what he knows about his health.

Mr. Richey: I know, if it is not hearsay, I am
not objecting to what he knows of his own knowledge. I am objecting to what he was told.
Mr. Brunings: Suppose a man tells you, "I am

not will the same of the bear of

The Master: I think he may answer to that extent Pas

Q. What did he tall you as to the state of his health, that is all! A. He was operated for hemorrhoids and he couldn't come. I saked him to come.

After we put those four pistons in the Sullivan of Cumbe Ford, I suppose we impetite them three or four times. If weakhit say that we impeted them more than once, but I know when that more aleveloped, the time we made that other change, why, we discovered that piston broken. By 'other change, 'I k mean I put in a piston of the ordinary I 1/2 oversite, one and a half thousandthe, that is, after ten thousandthe, and aswed a slot clear moress, the slot 2. We also made slot 4 almost persons in the slot 2. our of the state o

That slot 3 was almost all the way around, that is, one-hilf of the sphere, just as far as shown in Fig. 2, and in about the same position with respect to the bottom ring land.

That slot corresponding to the slot 4, started at the top center. It curved around just a trifle; we sawed it straight down, or almost straight down. We put a little slant in it to avoid a groove worn in the symder wall.

There were high spots in that one and a half over-size pisten, particularly above the numerals 3, and around here down the able of the cylinder along near the wrist pin bease, where we conduct get it slown through I flict every. That particular pisten does not have those adjustments in them that you see in Figs. 2 and 3. We put that in without the adjustments. It was actually put in the sylinder in place of the broken one. It high a tight fit and I need the general method that they used these days by using a grinding compound and lap-ning it in. ping it in.

After that piston was in the car, the car was run. It probably ran for a year or better. I got paid for that job. That was, I think, about five months after the adjustable pistons were put in. It was in the fall of the year, because we had no leaves on the trees, but we didn't have snow. The time snow falls in Ironwood varies. I suppose we get snow in September to about the middle of October and the last of October, and it stays on the ground until the first of November, as a cale. In the middle part of November the weather is cold with quite a bit of snow.

I am sure it was before snow was on the ground that this slotted piston with the vertical slot was put in. That same year we put in a piston with the adjustment.

We filed the piston on both sides, in the region of the wrist pin boss, and we had to file it away around the part that is above the slot 3. Lam quite sure we couldn't have gotten it in with fifteen thousandths over size unless we had done that. We couldn't get a piston bigger than the hole in the cylinder without filing, especially where the lower part of the piston travels. The top of that piston was smaller than the skirt. That was the general

practice in those days.

It was a new thing to file the piston to relieve it on the side opposite the wrist pin bosses, but we had used it around there occasionally; we had to use it at times. We had no means of re-boring and we had no machine for re-boring; so we lapped in our pistons. We discovered that by lapping them in we got a more or less funnel shaped cylinder anyway by the time we got our piston down to the bottom; so we took the pistons and split them and ran something inside of them and put on the connecting rod, reversed on the connecting rod as it came out of the piston, and lapped our cylinders through that way. The slanted split shown in the drawing of this patent 1,174,092 is very easy to be explained; we had no means of putting adjustment in here without the connecting rod interfering with the lower adjustment. If we had made the slot straight and put that particular adjustment on the sides, the connecting rod would either bend or buckle up, or smash up the machine.

In the description, 5-K3, where it says: "Slot 4 is cut diagonally for two purposes: first, to prevent sooring; second, for convenience of getting at the upper and lower piston adjustments," we could not have placed that

adjustment on the thrust or non-thrust side.

103 803

In explanation of the statement: in the description, 5-K3: "The piston is to be placed in motor as shown at motor view; this being for the purpose of keeping solid side of piston on explosion wall or the side of cylinder where the explosion or combustion forces piston against cylinder wall when on the power stroke, looking from the front slot on the right side. See view on motor view at right side of sketch? as the crank shaft rotates and the explosion occurs it shows, looking at it from the front, the thrust bearing is on the right side, on account of the angularity of this crank pin. I always thought that if that was slotted, that would be the proper way to install it.

We put adjustments in rather than leaving them off and just making the T-slot, because we had a lot of trouble with flutter and piston clatter, and I thought by cutting a slot in there and expanding it, we could probably take care of that flutter that was in the cars at that time,

when the cylinder was worn.

Pistons cost money in those days, We had pistons in stock, but we had no means of reboring, as I mentioned, and lapping was an expensive thing. When the piston was replaced, we had to lap them out. If we were just looking for piston flutter, we took the bottom and the head off. To adjust for this wear, we planned not to take the whole engine down; we worked from underneath; you could leave the pistons right in the cylinders.

I never gave up that idea of making an adjustable

piston and thit, even though the corner broke off.

I tried out another device about a year later, as my next development; where I used a perpendicular slot 4, and used two taper screws in it, and we installed this in that same job. We had a longitudinal and diagonal slot and almost a vertical slot, with a hole drilled right in the horizontal slot, tapered, with a boss on the inside; it is not shown here. By "horizontal slot" I mean the vertical slot 4.

That method of slotting differed from the one that we put in the Ford, in that it strengthened this corner here, brought this full skirt around. That piston had a horisontal slot around like 3 in my patent, and it had a vertical slot going down from almost the center, as near center as we could judge it. We attempted to spread the piston apart there by welding a boss on the inside of that vertical slot, one below and one above, and drilled a hole and reamed it out and put a lockwasher—no, a nut,

two nuts, on. One was a nut that drew it up, and the

other was the jamb nut.

I do not know where any of these original pintons, like my patent, are, which we put in the Sullivan car. I have looked for them. Neither do I know where the

piston is we replaced, the one in which the corner had been broken off. I also looked for that. The next step of adjustable piston in which there was an almost vertical slot corresponding to 4, and tapered screws, that pinton was put in that same job about a year or so later, and then a little later on in Justin & Trier's car. I don't know what became of those particular photons, however I have looked for them.

The pistons with the vertical slots were put in the Sullivan car about a year or so later; that was a set of four. It seems to me that model piston was cast in-

I had some pistons made like that installed in the Sullivan car, and I have just lately succeeded in locating one of them in my suphow's bacount in Chicago. I gave it to him about fourteen or fifteen years ago, I couldn't give the exact time. I recognized the piston as one that I had made. I can produce that piston. (Witness does on)

Mr. Bruninga: The pinton is marked for iden-tification "Defendants" Exhibit 5-K10."

(Narrative continued) That isothe piston that I found in my approve because it. It was made some time in the fall of '16 or early part of '17. That was included

in the latter the cole; made in the cole.

Describing this picton, I made minor changes. I suppose I had better beach this ring off. (Witness takes off ring.) I cort a diagonal slot under this lower ring of as to let any filings out of there or anything of that out, and then I corp, also, diagonal blot, through here, and as to let any filings out of there or mything of that cort, and then I out a slut diagonal blot, through here, and drilled a taper hole to one side; I had to shove that to one side is perfect to put the rod in. In other words, that has a partially inclined horizontal slot, which is set a little to one side, in the lowest ring groove. These little The are taper serve pins. The bole in the pinton wall was tapered also. The pinton then expands, opens up, expands the pinton and opens up the skirt. You can do that by hand.

We had to place that not a little to one side to clear

the connecting rod.

I think these particular pistons were made in St. Paul, by the Burke Mathine Company. I don't know whether they were in business then, or mot, but my brother-in-law got acquainted with him when he was down there, and he said he sould make up a few sets for me. I setably don't know where I got those pistons except what my brother in law told me.

very thin apparently, and when we canned it down with a hammer handle, which we remained it down with a hammer handle, which we usually use, it caved the top in, and we had to replace it with another one. I remem-

ber putting that hole in that piston.

By placing the dot in the lower ring land, we didn't have to press down this top ring around it. We made that for another purpose, too. We thought also by covering up the alot it wouldn't leak down through, if I remember right.

I thought that it was an advantage to put the hori-

sontal slot in the ring groove.

The log and expending construction was the same in Exhibit 5 R10 as it was in the pistons put into Sullivan's ear. They also had a taper server connection.

70 12, 1917, midre The la d to Walter Sper & Co. and marred for Richibit 5-K11, come from -D.C. and is one that I must have brought erick St Exhibit SERIO. 14 letter, and also two models. If **BET46** on the order of Rubibit 5-Ki0. It that it must have been the original up and cont to them. That p slot like in the patent.

I do not know where my letter of March 26, 1917 is. I don't know whether that particular letter that is referred to was cent to me by Louis Bagger & Company with the rest of the correspondence. Just what we have here is all that he cent to me.

Referring now to the piston like Exhibit 5-K10 with the straight slot and the adjustment, if I remember right, I think there was possibly three or four sets of four made up. They were made up before I sent Louis Bagger & Company that letter to which this is a reply. I think it was in the anging of the same year.

With the exception of the broken piston Exhibit 5-K10, we replaced that set that was previously in Sullivan & Cumbe's job and then later on we put a set in Jussen & Trier's, then we put a single on No. 1 cylinder on a Ford. These I don't recall, because I lost some of the trade. That was later on, probably 1918 or 19.

I got paid for those jobs.

The piston in Sullivan & Cumbe's car ran fairly well. It ran up to 1925, but we neglected it for three or four years; I never paid any more attention to it until it got into a wreak; that is as far as I located the car, in 1925, I think. The car required adjustments in that period, but we never touched it. It worked fair, but our adjustments hammered out and we changed it later on.

Those pistons were installed in that Sullivan & Cumbe car before I wrote Louis Bagger & Company that

second letter in 1917.

My financial condition during 1917 wasn't very good. At that time I was making \$2.50 a day. I didn't have any sickness at that time; but the sickness that really was serious was, I think; in 1914; my wife was cent to Rochester and I had a big doctor bill to pay there. I I wasn't cleared up until about 1921. That was the Mayo Brothers in Rochester. I sam not sure what the precise bill was but I know it was over \$350, approximately \$350 or \$450.

I had a hard time scraping up the \$35.00 I sent in with my application in July; I didn't have an easy time

scraping up any of it.

I do not know what delayed the filing of my appliestion from July 29, 1915, to October 1, 1915. I expected it to be filed as soon as the attorneys got my money.

I do not know what this case is about.

My expenses are being paid here. You wired me

I have no interest in the outcome of this case.

Mr. Bruninga: Take the witness.

Choss Examination by Mr. Richey.

The function of those No. 7 lock washers, as shown in Exhibit 5-K2, I suppose, was to lock the adjusting nuts into position and the apparatus in its adjustable position, so it couldn't move.

That piston, Exhibit 5-K10, is more rigid than the piston shown in my patent, and the function of the screws or bolts was to adjust the piston, then lock it rigidly in

position.

Mr. Bruninga: I want to offer in evidence Exhibits 5-K10 and 5-K11.

The Master: They will be received with the same reservation.

(Narrative continued) This wooden model I sent to Washington, I think, was about—I don't know whether smaller or larger, but it was a wooden model; I very distinctly remember that. I wouldn't say whether or not it was as big as a piston. I made so many different models, I made models in later years also, way back in 1917 and a later model I had been working on, I mean in 1927. The wooden model was as near as possible as I could make it to this drawing, Exhibit 5-K2. These parts here, I think, I am quite sure, was made out of actual metal, and it was screwed into the wood. I may have tapped it out; I am not sure. The model was partly metal and partly wood. That changed drawing is practically the same identical thing as the original; there is no difference, only I just make the thread marks in there, and he thought I abutted this up against there, if I remember right, in the correspondence, and then I had to explain it thoroughty, and made a hitle my-sag, identified that as a thread; that is the only thing.

The piatons that I made and put in that car were like this little drawing, because he didn't actually under-

stand it. I had to send that in there.

Q. You told Mr. Watts last February that you didn't remember what part of 1915 it was that you made up that set of pistons that you said you put in Sallivan's car, didn't you? A. Well, we argued it out there that day; tried to get it as near right as possible, and we have argued it out later. Charlie Garland and Mr. Stenstron and

Q. Please answer my question. I asked if you didn't tell Mr. Watts at that time that you didn't remember

what part of 1915 it was that you put those pistons in the Bullivan car. A. Well, I don't remember for sure just exactly what I did tell Mr. Watta

Q. You don't remember, although that was only a month ago or a little over a month ago, you don't re-member it? A. Sure I remember that.

Q. That is, you weren't sure a month ago what part of 1915 it was that you installed these pistons in this Sullivan car? A. Well, that I couldn't say exactly. I

know it was before that time

Q. As a matter of fact didn't you tell Mr. Watts on February 16, 1933 that you didn't remember at that time what time in 1915 it was that you put those pistons in that Sullivan carf A. I suppose I did, if that is the day.

(Narrative continued) Since then I have talked to

(Narrative continued)
Mr. Brunings about this matter.
I also told Mr. Watts at that time that this second set of pistons wasn't installed mill about 1917. I wasn't sure then what time in 1917 it was. I told Mr. Watts that I was certain this second set was not installed until I was certain this second set was not installed until I was certain this second set was not installed until I was certain this second set was not installed until I was certain this second set was not installed until I was certain this second set was not installed until I was certain this second set was not installed until the second set was not installed until the second set was not installed until the second set was not installed until set was not installed until second til after I moved out to my new house. We move to that new house some time in the middle of 1917.

I pleased this first set of pictons. Hits shown in my patent, in the Bullivan & Cambe on, and then that car drove out of Walter Barris games. I new it seemsonally after that. We probably imported the pictons once and may be turies; I can not bertain about that. If can't remember that. We were keeping them under observation all the time, with the lifes of finding out how they would work. We kept that upontial the time we took that set of pictons out and put in the according pin.

We take out the first set of pictons and put in the second set became that corner broke off and we had trouble with it more or less, and I naturally know that the other arrangement that I had made, I thought it would work better. That is, II found that the first set

the other arrangement (that II had made, II thought it would work better. That is, I found that the first set wasn't working estimatorily, so I put in the second set, which was an improvement on it. This diffin't apply to all of the pisters, not of the edjestable type and I had removed one and put in a plain one with just a diagonal and vertical slot, and then when we made this change, to con-tinue with our adjusting devices, we installed this Exhibit 5-K10 piston.

We took all of them out of the car, including the one that didn't have any adjusting means in it, and substituted the pistons that had the sdjusting means, because we thought that this 5-K10 was better than the others. It was better to a certain extent.

I also told Mr. Watts on February 16, 1983 that IL. wasn't even able to get the date when I took out the piston of the first set that broke; and I told him I was very much discouraged at the result of this piston breaking. I told him the truth about it.

That piston was 11% thousandths oversize of the standard cylinder bore. At the time my putent was standard cylinder bore. At the time my patent was granted we didn't know very much about how cylinders spread; we probably lapped them in; we had no thickness gauge or anything of that sort. We put our pistons in, and when they were free we called them good. Some of them set on us because we didn't know; we had no instruments, no means of adjusting those things. Mr. Barr was very slack in getting good tools.

That same answer applies to the rest of the pistons on the question of clearance. We were careful enough about charance to know when it wouldn't fit.

An to pictons like 5 K10, we would run that up no-til it would touth the cylinder wall and just probably use good judgment; that is all we ever used.

The first pictons we put in like those shown in the patent, we took old pictons and modified them and put them back in

I surrived in Chrysland on this trip on Bunday morning, and II have been there over sings. I have been stopping at the Chrysland Hotel with Mr. Brunings. If have seen Mr. Brunings and Mr. Dorris. If have been with them right along, and have had mostle with them.

I was patting 12.60 a day, and my wages were changed in 1917, the latter part, when I went to work for Gale,

I got more money.

I had some of my delt to the Mayo Brothers paid off in 1917, but I didn't pay it very fast. My financial condition was slightly better in 1917 than it was in 1915.

The garage I worked in handled and repaired the Ford our in 1915. Il suppose there were parts of eld cars around there, but we had a stack of new pistons, rings, pins, rade, and so forth. We had old pistons around there as well as new ones, and presumably some that had been junked or on the verge of being junked.

I told Mr. Watts that it was a difficult job to make that wooden model, and it was a difficult job; there was quite a little labor to it. It didn't take me very long, of course, I presume, to make it, not any longer than it would now. I ran the lathe by foot power. It belonged to my dad.

The seasons vary in Ironwood as they do in Cleveland. We have four seasons, but our winters are very long. The last part of September we have a flurry of snow, but winter doesn't really set in until the last part of October or the first part of November. We never have any leaves on the trees in the latter part of October.

Q. If I say I was up there one year in October at the Ironwood mine and the weather was still elear and those yellow leaves were still on the poplar trees, you would say that wasn't so? A. Well, there might be such a thing, but conditions change; there may be some times we have early and some times we have a late fall, that is true.

(Narrative continued) When Mr. Bruninga handed me this letter 5 K11. I heattated quite a little while before I recognized it.

Mr. Richey: That is all.

Ra Dissor Examination by Mr. Bruninga.

I think I read that letter, 5 K11, last Sunday. I am not sure; I wouldn't say, Mr. Brunings. I have really forgotten right now where I got that letter. I do know

forgotten right now where I got that letter. I do know that I received such a letter; I was living at 202 Frederick Street at that time. These other papers were received from Louis Begger & Company a few they ago.

I recognize the envelope you have just handed me as one sufficemed to Mr. Walter Schoongarth, Hotel Cheveland, Cleveland, Ohio, and is marked "Hotel Cheveland, K.7, and K-8. I don't know whether or not 5 K11 was in that envelope; I don't think so; I am not sure.

I had not seen the papers K-1 to K-8, inclusive, that were in that envelope, recently before I saw Mr. Watts. I have not seen them in the last few years. I do not know. whether or not I saw 5-K11 before the time I saw Mr. Watta

Mr. Watta did not tell me who he represented. I did say that I discussed the whole thing freely with him. At the time that I talked with him I didn't have these specific dates given in these letters and various other exhibits K-1 to K-8, before me. I tried to guess at the nonth of 1915 as near as I could. These letters helped me considerably.

I remember that all of the trees, that the leaves should be fallen off the trees before October, because I know we went duck hunting, and it is very noticeable the leaves fall in October. Timagine I went dock hunting in 1915; I always went duck hunting; I can't be certain.

I had not paid off Mayos in 1917. I imagine I was getting \$2.50 a day in 1917, if I remember right. My wife and my brother in law were depondent upon me at that time.

What I would call a standard piston in the Ford in 1915, if I remember right, was 34", that is the standard size, and it is bored out to the 3%". I never miked it up, but we took that into consideration and if they wanted, when you had to put in oversize, those pistons we received run all the way from 114, 214, 3, 5, and I think 10; I wouldn't say, 31; but we never used those larger ones at that time. I knew they came in that size.

When I spoke of a standard piston, that meant a piston that fit freely, that had a clearance. A 11/4 thousandth over-size piston was 11/2 thousandths bigger in diameter than the standard piston; I wouldn't say for sure just exactly 1½; it may have been two thousandths, but I don't remember that exactly.

When we fit those original pistons in Bullivan & Cumbe's our, we adjusted the size so it fit in the bottom of

the cylinder walls, and if it didn't drag too heavy, why,

we called it good. We didn't use any micrometers.

When I told Mr. Watta that I didn't make that second piston like Exhibit 5 K10 until after I moved into my new house in the middle of 1917, I said that I had not looked at the letter of April 2, 1917, which letter was addressed to my house. That second model piston that I worked on is referred to in that letter. If was wrong when I told Mr. Watts that that particular piston had not been made until I moved away from 202 Frederick Street.

When I now you after I had seen Mr. Watta, you told me to tell the truth as near as I could remember and the facts that I could get. You did not tell me what to testify. You did not tell me to be sure to fix the thing so you would win this case.

You particularly impressed upon me to tell the truth, and that was your method of doing business. You didn't try to change any of my dates that I had.

Mr. Brunings: Toffer in evidence envelope ad-dressed to Walter N. Behoengarth previously re-ferred to as Defendants' Exhibit 5-K-12.

(Re-direct closed.)

Ra-Cases Engagementon by Mr. Richey.

These papers come to me from Washington since I

I made any westign model before I cout in my patent. I stold Mr. Watta that during that time I made the drawing. My drawing was past in before I cout that in on that date, I am ours. I don't know what I told Mr. Watta about the weeten model. I den't remember just whether that drawing followed the weeten model or the weeten model fellowed the drawing; it must have been at the time, names on I recorded. at the time, someon on Lorenzaber telling Mr. Watte that

e II in

I diche't my anything in any of these letters to my attorneys about installing any of these pistons in the Sullivan & Course exception to this Erhibit 5-K11.

Mr. Risbey: That is all.

Ba Dinner Braninger by Mr. Bruninge.

of my attorneys to take out a patent applied

Mr. Brusinger Blat is all.

(Therespon afformant a at was taken to 9.50 a.m. of

((Thereupon at 9 30 a. m., Thursday, March 28, 1908, the hearing was recumed.)

Mr. Brunings: If want to make a statement.

Mr. Brunings: II want to make a statement, your Honor. There is another witness, Mr. Charles Garland, who was mentioned by Walter Scheme garth yesterday, who lives in Ironwood, Michigan. II intended to bring him here and I got in touch with him Smitey evening hefore Mr. Richey stated his position as to the Gallist Exhibits 48 and 51, and I found out that he had been operated on for piles.

you wastill will this only

He seemed to be in fair condition at that time. Then I wanted him to come here and he wired back that he couldn't; he thought he would come about Saturday, I mean that he could have Friday night. His destor told him the could have Friday. Then I 'phone him, both Mr. Sibenegarth and myself talked with him over the 'phone on Manday, but Manday, and I thought that he might the able to be here on Saturday morning, sail then I found cut, as Mr. Others gut the will be built a mileson and in bell will he great pain, as they would wroth a some of that hind. I don't know when he can be here; at any sate he cannot be described with third. I don't know when he can be here; at any sate he cannot be described with the cannot be here; at any sate he cannot be described when you have the same of addition where, we should know they the faint a case of addition where, we should know they the days a man in going to be iff you know they the days a man in going to be iff you know they are the faint of cannot be being by at the assessment of any other than go to be being Mr. Greatend income of any other than as up to be being Mr. Greatend income the faint of the will not that his writtens will be received and this will not that his writtens will be received and Mr. School will be received. I want while the apport of Mr. School will be received.

The Master: How long do you expect to use

Ar. Drawings; Ot. Just a country of the series of the seri

Mr. British Barrier and Control of the

The Minter: Well, when we get done with these

المرابع مستعمال

support that by an affidavit if necessary. I think

the record is clear on that point

The Master: Well, of course the practice in the state court, ordinarily, is that the pleadings may be amended to correspond with the proof. I assume that a similar rule prevails in the United States court

Mr. Richey: I think the rule is that if the excuse can be shown for the delay, but the rules in federal court are designed to prevent surprise.

The Master: I understand that.

Mr. Richey: New, where a man has known about the Scheengarth patent for ten years before sengarth patent for ten years before this suit, or five years, and hasn't set it up in his answer, the question arises whether be has the right to rely on that as newly discovered evidence. Well, we don't oppose it anyway.

The Master: Then it may be received, and you may he your amendments, in regular form so that they will be a part of the pleadings.

Mr. Brunings: I will do that. I can do that in

sich one of the suits.

Thereupon the plaintiffs recelled as a witness in re-buttal Zay Jayrams who, having been previously sworn, further testified as follows:

DIRECT EXAMINATION by Mr. Richey.

Q. Doctor, you testified in this case before? A. Yes

Q. You were present during the time Mr. Gulick was testifying? A. Part of the time.

Q. You heard some testimony here regarding the character of tests that are given aluminum pistons from

him! A. Yes.

Q. What if any experience have you had directly or indirectly in connection with the testing of aluminum pistons to determine whether or not they should be put into use? A. Since the latter part of 1915 I have had considerable experience with reference to trying to make aluminum pistons stay sold. (In that process I have witnessed various kinds of tests, at various places, and examined a great many pistons, after block tests and after road tests. I have also run road tests on pistons.

Q. Now, will you state just what are the character of tests that are employed to develop the characteristics of a new piston to determine whether or not it shall be used commercially, and give your reasons for the tests as far as you know? A. A great many factors, of course, enter into the adoption of a piston for stangard. Among the factors, and a very important one, is the cost of the piston, and I will consider principally the engineering features. The first step is what is known as a trial test of some nort. At the present time and for a good many years that trial test has usually been made on the block. The trial may include a good many changes of conditions during the early stages of the test, such as putting the pistons in with a dearance considered to be too little for proper operation, and then running the motor for a little while to see at what point the pistons seize or rub too hard. Then the pistons may be taken out and given additional elearance and run again. After the proper clearance is found in that way, then a block test for endurance is usually run. If that is estimatory, then the piston is usually put on the road. The road test is usually a fairly long and a fairly severe one, and among other things, it is best to have the road test carried on throughout an entire cycle of temperature changes, that is, it is desirable to have tests in the winter time and in the summer time as well in order to make certain that all of the varying conditions encountered in service are estimated. There is no particular standard of acceptance; it depends a good deal on the nature of the change, on the magnitude of the change. If it is a change of a small nature, it may not require so much testing to prove it in. A more radical change might require more testing. Furthermore, the matter is pretty much an arbitrary one because it is settled by human beings: the engineers of the engineering staff, if it is an engineering matter, or perhaps the purchasing department, if it is a matter of sconomics.

Q. What is a normal mileage on outdoor tests to test out pistons such as these split skirt pistons?

Mr. Bruninga: Now, or in 1911?

Mr. Richey: Well, say as early as you knew anything about it?

A. I don't know as I could name any normal mile-

Q. Why is it that these pistons have to be tested out thoroughly before they go into use? A. Because they must function satisfactorily under a great variety of conditions, and they must endure. The pistons must not

break; they must be serviceable over a relatively long period of time.

riod of time.

Q. Now, would you look at the Schoonparth; patent
1,174,092 and state whether or not you have read that
patent over and are familiar with the disclosure? A.
Yes, Lihave seen thin patent before said have read it.

O Now, will you compare that in structure, mote of operation and results with the distlocures of each of the patents in suit? A. The Scheengarth patent 11,174,092 relates to apparen which is adjustable in dismeter. The picture is so eletted herisantally and spirally, or approximately vertically, as to parmit the cities to be changed in the secret sessall amount. The detting of the shirt is not designed to change the dismeter of the picture and designed to change the dismeter of the picture alignment by flatting when the picture is in specialism. In that respect the Schoengarth patent has no relation to the Guide construction, the Jardine construction or the Maynard construction, the Jardine construction or the Schoengarth patent in all of which are intended to flat within in the mater. The object of the Schoengarth patentials in the mater. The object of the Schoengarth patentials in the smater. When a moter has been run according distance; the sylinder barrologues and the mater has been run according distance; the sylinder barrologues and the picture and the sylinder and to make the patent and the picture and the sylinder the start to that when the share and the sylinder and to make the picture while in place or the start we could be made of the picture of leaking rings and must so there are a shirt that the adjustance is over adjustable whire the picture or all must so there are a start the made. After the adjustment the arms and must so there could be made. After the adjustment the arms and must be appreciated in the traine of the first place, or the arms and the sylinder and the arms and the schoel and the made. After the adjustment

There is smother feature of the pitent which well not be considered as any) the adjustable buring in the unit best. The Ribernageth piston would in fact be more rigid than the untilinary piston because of the sine and location of the locking rings. If would also be heavier and it would be what is known as a composite piston, that is, one composed of more than one part. The piston design itself is not imperiant in the Schougerth disclosure so it has no relation to the Reimmedekneckt patent. The nature of the locking rings and the absence of rolled would among other things, make the piston have no relation to the Mosers patent.

rings were emitted, and so suggestion that they can be omitted or should be omitted is contained in the putent, at least I now some, the School garth piston would still not be similar to any of the put ats in unit. No relief from the elet to the bettom ring groove, no relief from the horizontal elet in the bettom ring groove in the Schoengarth pisten is described or auggested, and there is no relief described around the boss section. In my opinion therefore, the Schoengarth putent has no relation whatseever to any of the patents in suit.

(Adjournment thereupon taken to 1:30 p.m. of the same day.)

(130 p.m., Friday, March 17, 1933, the hearing

Q. Now, Doctor, you have discussed the Schoengarth piston without adjusting means in it, and structure. Will you also take up the question of operation

garth piston without diffusting means in it, and structure. Will you also take up the question of operation and results as compared with the patents in suit? A. The Schoengarth piston without the looking rings, would not operate like the pistons of the patent in suit nor would it predices the same results.

Q. And would you give your resease for your answer! A. The pisco on the piston where flexibility would be most resoled to help against wall presented, would be the section just below the lowest ring. This section on the Schoengarth piston would have the full skirt diameter and wealth not be flexible, nor could the diameter be decreased by distortion in any direction without increasing the diameter in some other direction. The piston would have flexibility at the bottom of the skirt, where it would not be mosted, and no flexibility at the top of the skirt, are are if it is must mosted, and absolutely reconstruct most of skirt flexibility.

Q. Now, you were here and heard Mr. Gulick testify about the pistons and what the tests were and how they operated mining the tests, were you not? A. Yes, I heard most of that testimony with reference to operation and the operation and results, with the piston as it is shown in the Schoengarth patent 1,174,092! A. The

it is shown in the Schoengarth patent 1,174,0821 A. The

Gulick 1911 piston, according to his description, would have one horizontal slot and one vertical slot. The horisontal slot, as I understood it, would mark the top of the skirt. That is, the head relief extended from the head proper down to the horisontal slot. This would divide the piston into two parts; one of which would be nonflexible, but with relief, and the other part flexible, with no relief. The skirt flexibility would be gained as a result of the vertical slot which in the Gulick piston Exhibit 48 extends from the horisontal slot, near one end of such horisontal slot, spirally around the piston skirt, ending, say, about 1%" from the vertical line drawn from one boss to the bottom of the skirt. The Guliek piston would have a flexible skirt, more flexible at the bottom than at the top of the skirt, but nevertheless the skirt would have Sexibility throughout its bearing length. In the Schoengarth piston there is no flexibility of the skirt when the piston is operating in the motor. So that the Schoengarth piston is a rigid type piston, as it is used, and the Gulick pinton has akirt flexibility with head relief properly placed so that the skirt flexibility would have opportunity to function to compensate for extra expansion of the piston. The 1911 piston, apparently, had no relief in the skirt section around the bosses, and to the extent that it had no such relief, it would not permit of as much compensation for extra expansion as it would have had the relief been placed around the bosses; but nevertheless, it was a cast iron piston and the expansion problems were not as severe in cast iron pistons as in aluminum pistons, and therefore the Gulick 1911 would function, to a degree at any rate, as a flexible skirt piston. The Guliek 1914 piston, as shown in Exhibit 51, is a flexible skirt piston with the horizontal slot extending completely around the skirt. With the one vertical slot on one of the thrust faces, between the besses, the Guliek 1914 pieton would operate as a flexible skirt pieton. This assumes that the head section is relieved by machining to a smaller diameter than the skirt section, and that the horizontal slot marks the boundary between such relieved section and the skirt section proper, which I understand is the construction in Exhibit 51. This Exhibit 51 piston is considerably more flexible at the top of the skirt where flexibility is most needed than is the Gulick 1911 piston. Not only does the Gulick 1914 piston have more flexibility than the Gulick 1911 piston because of the greater length of the horizontal slot, but the web or rib construction is such as to make possible some compensation for expansion by distortion of the skirt section as the result of cylinder wall, pressure. None of these factors are found in the Schoengarth patent and, consequently, the Schoengarth piston differs from both the Gulick 1911 and the Gulick 1914 pistons in construction, mode of operation and results.

Q. With respect to method of testing pistons, say back in 1914 and '15 when you first became connected with this matter, not only pistons but automobile equipment, will you state whether or not to your knowledge it was customary for engineers and employees of the company to test things in their own or factory cars! A. Yes, it

Was.

Q. Now, in the testing of such a piston, what is considered in this industry as the termination of the test and the dividing line between the test and the commercial activity with respect to the piston? A. Either when the test is declared to be finished and a conclusion reached one way or the other, or when the device which is being

tested is adopted or used as standard.

Q. And what physical act takes place with respect to the rinning of the device at those dividing lines? That is, perhaps you don't understand me. What I mean is, state whether or not the device is continued to be tested when you come to that dividing line. A. Oh, additional tests might be made; but I should say that if you were making one test on one device and the test is concluded and report is made, it is either satisfactory or it is not satisfactory; if it is satisfactory presumably the part is accepted for standard.

Q. Now, you heard Mr. Guliek testify vesterday as to the tests he made on his 1911, 1914 and 1915 pistons. Will you state whether or not from your experience and observation of tests of pistons of that character, the operations he performed, the miles he ran, exceeded what was necessary to make the proper tests on those pistons?

Mr. Brunings: I object to it, first, because the witness cannot testify what was the practice in 1911 or even in 1914, he didn't come into this field until December, 1915.

The Master: I understood his services began, in this branch of the science after the war was declared.

Mr. Bichey: There would be no material change.

Mr. Bruninga: That goes to the weight of the

Mr. Richey: To the weight of the answer, yes. The Master: With that limitation he may answer.

A. The one thing a piston must flot do in service is to break. When a piston breaks, it is quite apt to cause so much damage to the ear that an expensive overhaul becomes necessary, or even the motor may be wrecked. So that I should say that those pistons certainly were not run further than was necessary to determine their durability.

Q. And by durability, you mean their ability to go

without breaking? A. Yes.

Q. That is, to perform their desired function so as to prove their utility with respect to breaking! A. That is frue.

Q. You were here when Mr. Monckmeier testified about these Exhibits 3-V and 3-W, weren't you! A. Yes.

(At this point the testimony of Tibbetts, Record pages 859 to 877, was taken)

(At 9:00 a.m., Saturday, March 18, 1933, the hearing was recumed.)

Zax Juvens, being recalled, further testified as fol-

Dunor Examination by Mr. Richey

Q. Now, will you compare each of the Exhibits 3-V and 3-W, the pistons that were produced by Mr. Montk-meter, with each of the patents in suit, in structure, mode of operation, and results? A. Considering the Monekmeter from piston, Defendants' Exhibit 3-V, I think it would be desirable to find by micrometer measurements certain dimensions on the piston. If have here a micrometer which measures distances between four and five inches readily to the nearest thomsaudth of an inch. This is the micrometer which is used regularly in the laboratories of the Aluminum Company of America at Harvard Avenue in Cleveland for such measurements. The first measurement which I am making is the diameter of the piston across the boss region just below the boss holes.

This diameter is 4.478". The next diameter is the one across the boss region but just above the boss boles. This diameter is 4.478". The mext diameter is across the bottom ring groove, the width of the groove being small enough so that the microsser surfaces sugges at the same time both edges of the groove. The diameter is 4.479". This groove is above the horizontal slots in the piston. The next measurement is across the boss diameter but of the second narrow ring groove. The term "second" in this case indicating the appearance of the narrow ring groove, and the other narrow ring groove is the lower of all the ring grooves. This diameter is 4.477". The next measurement is still parallel with the bosses but neroes the hand between the top ring groove and the ring groove with semicircular cross section, which may be called the second large ring groove. This diameter is 4.475". The next measurement is across the top land, parallel with the bosses, the measurement being about 4.467".

Q. These last measurements were unde in which direction? A. All the measurements up to this point have been made parallel with the line drawn between the two bosses. It will now make some diameter measurements in a direction approximately at right angles to the previous measurements, namely, across the thrust faces of the skirt portion and in a smilar direction across the head. The first measurement in this direction is across the the top land or merous the head section; this diameter is approximately 4.467. The diameter in the same direction across the first land is 4.465". Across the top narrow ring groove in the same direction it is 4.468". Across the bottom narrow ring groove just above the ends of the vertical slot the diameter is 4.472". Just below the horizontal plane, this diameter would be just above the horizontal section taken across the tops of the boss holes. The next diameter, which is just below the horizontal section but in the line immediately below the boss holes, the diameter across the thrust faces in 4.478". These measurements would indicate that if the piston had been fitted in a sylinder 4½" in diameter, the electrone would have been 000" to the skirt section, and at the bottom merrow ring and also indicate that there was no been or side relief on the piston at the time of machining. The measurements would also indicate that there was no been or side relief on the piston at the time of machining. The measurements

would also indicate that the piston had been run in a motor and the wear across the thrust faces has been considerable. The measurements also indicate that the real division between the head section and the guide section in this piston is at the upper narrow ring groove, which is more than %" above the horizontal slot. The fact that the guide section of the piston extended at least up to the upper narrow ring groove is indicated not only by the measurements parallel with the bosses where the wear would have been a minimum in the operation of the motor, but it is also indicated by the measurements scross the thrust faces which indicate the elliptical mature of the head section up to the upper narrow ring. Had these ring land portions not been bearing against the cylinder wall, they would not have worn to the expiston with the Gulick patent in suit, then, I would say that it does not have the construction of the Gulick patent in suit, it does not have the mode of operation, nor could it give the results of the Gulick patent in suit. The Gulick patent in suit describes the division of a piston into two parts. For example, as stated beginning line 41 on page 1 of the Gulick patent: "Referring to the drawings, 10 represents the head portion of a piston, and 11 is the skirt or guide portion which is shown as separated at its periphery from the head, leaving an annular alit or opening 13 there between." The skirt or guide portion of the Guliek putent is the portion which beers against the cylinder wall. The head is not supposed to bear against the cylinder wall; if it did, it would become part of the guide section. Gulick therefore above the horizontal slotting caparating the head section from the guide section, and the vertical slotting in the guide section only. The Galick piston can function to com-pensate for excessive expansion because the head section does not serve as a guide; that is, does not touch the cylinder wall, and the skirt or guide section is made flexible so that it can compensate for extra expansion as the piston heats up.

The Monckmeier cust iron piston could not function in a motor like the Gulick piston. The slotting in the Monckmeier piston is to my mind absolutely useless and could be nothing but impairment of the piston in its functioning, except that the great distortion of the cylinder barrel in its lower portion might permit the bottom of the skirt to adjust itself more readily to the distorted

contour. In so far as clearance is concerned in the Monckmeier cast iron piston I have made a calculation which is very simple, showing that if the cylinder barrel was 41/2" in diameter, as suggested, the clearance would be at least 20 thousandths of an inch in all diameters, and the piston would have to become 700° F hotter than the cylinder before seizure due to high piston temperature could result. In this piston 3-V, long before the slots could have any opportunity to be any help in this piston, the ring land portion, that is, the lands adjacent the narrow rings, would seem against the cylinder walls. These ring portions would be much botter than the lower portions of the skirt and hence would expand more than the lower portions, merely because they are hotter, and because originally they were the same dismeter as the skirt portions, those portions must rub against the cylinder walls first. Those land portions adjacent the parrow ring groove therefore were the true guides of the upper portions of the Monckmeier cust iron piston.

Considering the piston from the standpoint of the Mooers piston, there is no combination of horizontal slotting and skirt or guide section relief as in Mooers; so the Monckmeier piston can have no bearing on the Mooers

patent.

Considering the Schmiedeknecht patent, there is no suggestion that the Monckmeier patent has anything to do with the Schmiedeknecht construction; the two con-

structions are different.

Considering the Jardine patent in suit, the Monckmeier cost iron piston can have no relation to it, as I see
it, because the Jardine patent combines the relief of the
head section down to the guide section. On page I, line 87
of the Jardine patent, is found the following: "The flange
4 of the head portion which has a smaller outer diameter
than the guide portion 2, the diameter of the latter being
slightly smaller than the internal diameter of the cylinder
in which it is to function?—so that the Jardine patent
clearly describes the head portion as being of smaller
diameter than the guide portion, and the guide portion
being separated from the head portion by the horizontal
slots. Furthermore, the Jardine construction relates to
relief around the boss section which is not provided or
found in the Monckmeier piston. Therefore the Monckmeier piston has a different construction, different mode
of operation and gives a different result from the Jardine
construction.

Considering the Maynard patent in suit, the same things as said of the Jardine patent apply. This matter of the separation of the head section from the guide section is shown in an exaggerated way even in one of the drawings of the Maynard patent in suit, Fig. 3. The horizontal asparation is shown at E, and the skirt or suide section at D. and the head section at B. The very ameter of the head section parated by the horisontal e Monskmeier piston on from the Maynard o of operation from the t result from the

e mext piston, this 700° an internal combus-

rat all! A. Not without harming

t you thought that this piston, Will you state whether or A. Of course I wall say whether it has be de block have been put to after and ofter the Motting, this the had been med after the slotting that that web would have bruken up. Also the pirton shows earbon collection in various places. It shows that there has been an attempt to remove the earbon deposit. It has mostly been removed from the piston, but you still find carbon deposit on the head. You had earbon deposit in the ring grooves, and you find earbon deposit just above the bees on one side, but you find no carbon deposit that can be seen, even with the hand glass, in the slots. Furthermore, the slots look surprisingly slike, merely machined surfaces that have been rusted by standing around. So that I should say that the evidence on the surface of the piston is more in the direction that the piston had never been run after the slots had been put in.

Of These pistons here that were put in by defendant,

Q. These pistons here that were put in by defendant, Exhibits E. F. and B. for example, you can tell they have been run, can you not by the carbon deposit! A. Yes;

not the slightest doubt about that.

Q. And compare the condition of the slots in those. pistons, particularly with respect to carbon deposit, with that of Exhibit S.V. A. Well, the carbon deposit in, say, Defendants I Exhibit E, can be seen on the out surfaces.

Q. Which out surfaces do you refer to! A. The slotted surfaces, as well as on other parts of the piston.

Q. What have you to say in the use of slotted pistons with respect to whether or not the carbon does de-posit in the slots when they are mod? A. Well, the carbon is apt to deposit on any surface that gets hot enough, where there is oil. Now, whether it is cleaned off entirely or can be cleaned off entirely by some abra-sion method afterwards, that is a matter which I am not so familiar with.

Q. Well, what about where there in a large clearance, as in this Mondameier piston, would there liable to be more or less carbon deposit than where there is a small clearance! A. There should be more carbon deposit, where there is a large clearance.

Q. Now, will you maswer with respect to Enhibit 3-W the same question? A. In the first place, the Exhibit 3-W, which is the Monekweier adminum piston, is so mutilated that it is difficult to gain such a complete is so multisted that it is difficult to gain such a complete story as the iron piston reveals. It is possible, however, to take diameter measurements across the boss region, the first one of which I will make is just below the ends of the boss holes. The diameter is about 4473. There is then a band, which is machined around the entire circumference of the piston of smaller diameter in this portion is 4422. Just above this hand there is another portion of the skirt of the skirt. The diameter in this portion of the skirt of the land between the two ring grows is about 4470. The diameter of the taid selected the head is 4464. The diameter of the head at right angles to the line between the beases is about 4461. The skirt is completely broken acrey or one of the thrust faces, so no measurements can be made there. Judging from the measurements, however, it seems clear that the original clearance of the skirt section just below the bottom ring grows, and the remainder of the skirt section previously mentioned, were originally machined to the same diameter. There is only snough metal in the piston to make a measurement across the thrust faces, at the skirt portion

adjacent the lower ring groove. This diameter is 4.464". It seems fairly clear, therefore, that the Mondameier aluminum piston has a division line between the head section and the guide section at at least not lower than the bottom ring groove. The horizontal slot therefore in the aluminum piston would be placed in the guide section proper rather than at the division between the guide section and the head section, some %" below the top of the guide section proper. This is indicated by the measurements across the boss region, where the diameters would be expected to remain more nearly the same as the origimal diameters, and also by the one diameter measurement cross the top of the skirt at the thrust faces, indicating, if anything, that the piston has been worn at the top of the skirt on the thrust faces. If it has been form by o use, it is proof that the head section does not run down to the borizontal slot. Considering this Defendant's Exhibit 3-W, or the Monokmeier aluminum piston, therefore, with reference to the patents in suit, it does not have the same construction as Gulick, nor the same mode of operation, nor can it give the same results, for the reasons given in connection with my discussion of the skarsier iron piston Exhibit 3-V. This Monckmeier aluminum plates can have no relation to the Mooers pis-ton, because the horizontal electing is not combined with the relief around the division between the head section and the guide section. There is no hormoutal slotting in the Mesckesser aluminum piston at the division between the head and the guide section, as is called for in Moorra. The Mesckesser aluminum piston does not have the same it give the same revalts as Jardine, for the same reasons given in connection with my discussion of Exhibit 3-V. The Mesickmeter Assistant piston does not knye the same construction; we does it have the same made of operation; nor can be give the same results as the Maynard construction, for the reasons given in my discussion of the Monchaster piston 3-V.

Q. You have heard Mr. Monckmeier testify as to the clearances that were used with this aluminum piston, did

you not? A. Yes./

Q. Have you made any calculations to determine how not the aluminum pistons would have to be with those clearances before there was any operation due to the slotting? A. I started to make a calculation on the basis of the diameter of this piston. 3-W, but if the piston was used there was probability of a cylinder re-grind

before it was put in, which would make any calculation impossible. However, considering merely the dimensions of this piston on the basis of a 41/4" diameter cylinder bore it would have to become some 450° F hotter than the cylinder before rubbing would take place or before seizure could occur. But this piston has more clearance than was given even the 5" aluminum piston in the Liberty motor, so that it seems to me likely there would be no chance of this piston seising in a motor even if it had never been slotted even if the slots had been put in properly so that they could function; but this piston Exhibit 3-W would seize at the top of the skirt just as quickly or a little more quickly with the clots in; as with the slots out. I say a little more quickly because the top of the akirt would become a lot hotter with the slots in than with the slots out, and therefore the slotting of this piston could not have had anything to do with prevention of seizing.

Q. The question came up yesterday about, with respect to the mutter of slapping of pistons in the Liberty motor. Are you familiar with the use of the aluminum

pistons in the Liberty motor! A. Yes.

Q. Will you state whether or not they were slotted, if you know, and if not, why not? A. They were not slotted. They were not slotted, because the object is to get as much power as possible from the aircraft motor, and the power is not helped by this slotting. The poweris impaired somewhat by the slotting. Furthermore, these pistons in aircraft motors are subjected to tre-mendous mechanical forces in order to develop the large. horsepowers that they do. So that mechanical strength is more important in an aircraft motor than it is in a pleasure car motor. I don't mean that it is not important to have strength in motor cer pistons; but I mean that the niroraft motor pistons are subjected to higher stresses than the pleasure car motor pistons. So that the nircraft motor pistons are not even slotted today. Q. Well, is the matter of piston slap of any impor-

tance in aircraft? A. No, it is not.

Q. For that reason, what clearance is used in air-plane motors? A. Generous clearance is used, enough to make certain that there will be no seizure or hard rubbing of the piston against the cylinder wall.

(Recess taken.)

Q. I call your attention to Defendants Exhibit 4-G, the article by Mr. Gunn on "Aluminum Piston Design." Did you know Mr. Gunn! A. Yes.

Q. Who was he? A. He was chief automotive engineer for the Premier Company in Indianapolis when I first became acquainted with him. He later became associated with the Aluminum Castings Company or its successor company, and still later went to Packard Motor Car Company.

Q. Do you know in my way how familiar he was with the abuniaum piston problem back in 1990! A. You he was very familiar with the problem. He did work on the problem for the Aluminum Gastings Com-

pnay or its successors.

Q. And about when was that . A. I think somewhere about the close of the world war and for some time

thereafter.

Q. Now, will you look at his article and the pistons designs are and state what the purposes of the various designs are and what the history of them in so far as you know? A. This article deals particularly with advancement photon design; its abso treats more particularly of the aluminum piston design for passenger our engines, as sudiented by the headline on the first page of the article, page 362. The pistons are designed, according to Guns, with two principles in using further it is designed with the object of conducting heat away from the head to the spinules walls out the latest of partly mouth at the parent hand. He can an amount out the part up the shirt fr nvings, Figs. 1, 137 wide or ribe and but nt in these but heat from the head heat from the head of the pisten and carry it do the skirt. Then he describes some other types of tons. Pigs. 4 and 5 are two other types. Fig. (known, I think, an the heavegless type of pasten. I then't see anything distinguishable over ordinary pastens in Pig. 4. Pig. 6 is the Blearth type pisten, which has already been referred to in this case. Pig. 7 is the Aluminum Clastings Company double-walled shirt pisten. which I referred to in the examination in prime facie.

Fig. 8 is apparently a piston of the Long type, with the six vertical slots and internal webs, being a double walled skirt structure. Fig. 9 is the Franquist type of piston. Fig. 10 is a composite piston; and Fig. 11 is a piston with heat insulating material pet into the head section, that is, the head section is made hellow, and some material like infusorial earth is supposed to be put in the head section and them a solid covering put over that, so that the heat caused be conducted readily from the head into the remaining parts of the piston. I think this article describes the problems pretty well and represents the efforts made to solve the problem, without, however, getting very far in the direction of giving the public any real solution of the aluminum piston problem for pleasure car purposes.

Q. You spake of the piston shown in Fig. 8 as being of the Long type. In that the same as or different from the pistons Exhibits F and E? A. Seems to be about the same with the exception of the rib in the head,

about the same with the exception of the rib in the head, and the drawing in the Gunn article shows no bees relief.

Q. What about the relation between the webs and the bosses? A. Oh, yes, one of the bosses in the Gunn article is attached only to the skirt portion and not to the web portion, which is not the construction of the Exhibits E good F.

hibits E and F.
Q. Do you know why that change was made in Fig. 8 over the Long piston? A. I anspect it may be drawn in there as a means to compensate for expansion across the bosses.

Q. Now, did say of those pistons illustrated in this Gum artible come into assessful commercial need A. I think it might be said that some of the trunk type pistons were assessfully said commercially prior to the introduction of the farible skirt sistens.

Q. Which ency for example, Bhatrated in this article? A. Well, not any specifically ardinary truck but Fig. 1 was not far different from the ordinary truck type

Q. That is, used in tracks meatly? A. Yee; but it had been meet in pleasure care, see, to an extent, prior to the introduction of the flexible shirt place.

Q. That didn't care the slapping? A. We, the slap ping was embared; it want't cared. He far as I know none of the other pieters were brought into remnervia use, excessful commercial as

Q. Would you state whether or not this article fairly represents the efforts to solve the piston problem at that

time that went so far as to become tested out seriously and then failed? A. I think it does, yes; it gives a

fairly good representation of it.

Q. Now, will you next take up the Van Bever patent 1,031,212 and compare the piston illustrated and described in that patent with each of the patents in suit as to structure, mode of operation and results! A. This patent is another one of the lock ring constructions, somewhat like the Schoengarth patent, only the adjustment here is only at the bottom of the skirt. The object is stated, beginning line 15 in the patent as providing a means to enlarge the akirt of the piston after it has worn down to a certain extent and after it has become loose. The skirt is given four vertical alots, each slot being approximately at 90° from adjacent slots, and the ring 17 is screwed into the inside of the bottom of the skirt with a tapered thread. By these means the skirt can be expanded to a larger diameter at the bottom. That appears to be the object of Van Bever in this patent. He does not have a flexible skirt piston, even at the bottom of the skirt; that is, the skirt does not flex during operation. It seems to me, therefore, that the piston being different in construction and mode of operation and results from those of any of the patents in suit that it has no bearing whatsoever on any of the patents in suit.

Q. Now, will you answer the same question with respect to this piston, Exhibit B? A. Exhibit B has four approximately vertical alots extending to a point in the skirt section a little above the top of the bess holes. This produces flexibility in the bottom of the skirt section, but none at the top of the skirt portion where it is really needed. This Exhibit B piston therefore is not a flexible akirt piston from the standpoint of the constructions of the patents in unit. It merely provides some flexibility at the bottom of the skirt where it is not needed, and the skirt at the top where it should be flexible in aluminum pistons for pleasure cars, is rigid, has no flexibility, and the skirt has no horizontal separation from the head section. So Exhibit B does not have the construction of any of the patents in suit, and it does not give the results of any of the patents in suit, and it does not give the results of any of the patents in suit.

Q. Will you next take up the patent to Vincent 1,279,134 and compare that with the patents in suit in the same way! A. The Vincent patent relates, for the greater part, to what is known as composite pistons.

The state of the s

that is, pistons composed of more than one part. There are several types shown in the drawings, only one of which, with the exception of a ring, can be regarded as a one-piece or integral piston. That is shown in Fig. 7. The construction shown in Fig. 7 is supposed to operate in such a manner that an internally expanding ring forces the bottom of the skirt toward the cylinder wall. There are four slots in the piston, very much as shown in Van Bever. The difference between this and Van Bever is that the ring in the Vincent patent is not a lock ring but an expanding ring. This piston would func-tion somewhat like Exhibit B except that the resiliency of the walls of the piston skirt would be either augmented or impaired by the spring ring in the bottom of the skirt. Inasmuch as this piston has no horizontal separation between the head portion and the guide portion, and masmuch as there is no flexibility at the top of the skirt where it is really needed, the piston does not have the same construction as those of the patent, or any of the patents in suit, nor does it have the same mode of operation, nor does it give the results. I think the construction of these flexible composite designs places the other Vincent description so far outside the subject matter of the patents in suit that they perhaps need no further consideration.

Mr. Bichey: My learned adversary, what is the effective date you claim for this British patent to Hives?

Mr. Bruninga: The application for the British patent was accepted April 8, 1920; six weeks after accepting, such a British patent is open for public inspection. We claim that is the date of publication, six weeks after April 8, 1920.

Mr. Bichey: Six weeks would be what date,—do you claim the effective date? Well, we have a certified copy here showing the date as the 24th of June, 1920.

Mr. Bruninga: That is the scaling date. I wal grant that is the scaling date. I grant that the scaling date is June 24, 1920; but I rely upon the publication date, which is six weeks after acceptance, which would make it May 20, 1920.

Mr. Birhey: Well, if it becomes important, we will have to put you to proof on that date, because we understand the scaling date is the effective date.

we understand the scaling date is the effective date.

Mr. Bruninga: You will agree it was received in the Patent Office on June 1, 1920?

Mr. Richey: We agree that our adversary produces a copy of the Hives patent, photostatic copy States Patent Office as of June 1, 1920.

Mr. Bruninga: I claim the date of May 20, 1920, as the publication.

The Master: You don't object to it!

Mr. Bruninga: No; and I want to get the date. I understand you don't object because there are photostatic copies produced?

Mr. Richey: No, sir. No, we have a stipula-

tion on that

Q. Doctor, will you next take up the British patent to Rainforth 6,326 of 1912, and compare the piston illustrated and described therein in structure, mode of operation and results, with each of the pistons of the patent in suit! A. The Rainforth piston is comething like Exin suit? A. The Rainforth piston is comething like Exhibit B except as shown it has more of the slots running from the bottom of the piston skirt or from nanrly the bottom of the piston skirt up to approximately the level of the bottom of the boss holes. This Rainforth piston is even more imprecised than the Exhibit B because the skirt is supposed to be "sprung" into the cylinder barrel. The top of the guide section must recessarily some well above the bosses, so this piston has no horizontal superation between the guide section and the head section, and bearer is different in construction from the first tion, and hence is different in construction from the flextion, and bessee is different in construction from the askible skirt patents in suit. It has no relation, as I see it, to either Moore or Schmiedeknecht. My conclusion is therefore that this piston is far worse than Eithibit B fruit a practical standpoint.

Q. What kind of fit is contemplated with that Rainforth piston! A. A spring fit.

Q. And just what do you mean by a spring fit! A. That the shirt of the piston would be originally prepared larger than the bore of the cylinder, and the piston would be arrange into the cylinder when the cylinder was cold.

be sprung into the cylinder when the cylinder was cold.

O. Then the piston would start with a tight fit and heated up what would happen? A. When if heated

up it would be still tighter.
Q. If it would rub in the beginning, when it was heated up, what would happen? A. The piston could not function properly under those conditions; it would rub so tightly that there would not be enough power pro-duced in the engine, or the piston would break due to poor mechanical strength, or it would seize. Q. Was that piston ever used commercially, to your

knowledge! A. No.

Q. Who is D. Napier & Sons, Ltd., of England! A. Well, they are, to the best of my knowledge, motor car manufacturers.

Q. They manufactured cars on quite an extensive

scale, didn't they! A Yes, they have in the past.

O. Will you look at page 2 there and consider that the piston had been modified in the manner suggested in connection with the U-shape alots, and compare such pistons with the materials in suit! A Apparently the U-shaped alots maintened on page 2 of the patent are to be put in the "outer parties" of the piston, which is the skirt portion. The month of what I take to be the arms of the U-shaped alots maintened on page 2 of the patent. skirt portion. The benefit of what I take to be the arms of the U would run eround the circumference of the skirt in some manner. The piston is supposed to be fitted similar to the piston with the vertical slots, indicating a spring fit. Such a piston would have no more bearing on the parents in suit than the pistons shown in Fig. 1 or 2 of the drawings.

Q. Will you state whether or not those pistons with

the U-shaped slot also embody the spring fit with the

the U-shaped alot also embody the spring fit with the resulting operation, that you have already described?

A It is so indicated in the paragraph beginning line 6, page 2, that they are supposed to have the spring fit.

O. Now will you turn to the Spillman patent 1,325,-176, and compare that in attracture, made of operation and results with the sistern shown in each of the Jardine and Mayners patents? A This Spillman piston has a head section and a guide section, the head section apparently being separated in part from the guide section by horsestal slots and then the guide section is made fiexible by magnet of two spiral slots extending from the bottom of the piston skirt almost half way around the puton, each spiral slot connecting with one of the ends of each horsestal slot. The Spillman piston is the efforce a very flexible piston, in fact, it is so flexible that fore a very flexible piston, in fact, it is so flexible that it is no good. The explosion forces on the head of the piston are transmitted to the thrust face in such a menner as to collapse the skirt metal in the so-called flexible tongues. For example, in Fig. 1 of the drawing of the patent, one of the so-called tongues may be indicated as the portion bounded by the horizontal alot and the nown in solid outline. The end of the tongue would therefore be the intersection between the horisontal slot and the spiral slot. The end of the tongue

is so flexible that the entire wall pressure must be taken adjacent the end of the tongue by the remainder of the skirt. This produces an excessive stress on the large end of the other tongue, which may be regarded as bounded by the spiral slot, shown in solid lines, and the bottom of the skirt itself. The high stress on the large end of this tongue produces deformation and collapse which moves the small end of the same tongue inwardly from the cylinder wall permanently so that it does not bear on the cylinder wall. The result of this construction is that the piston skirt is not strong enough to stand the usage in a motor. Collapse of the solid portions obtains and the piston becomes unsatisfactory. The reason for this result is partly in the nature of the slotting, which is different from that shown in the Jardine and in the Maynard patents in suit. In the Jardine patent, for example, the thrust forces are resisted by the webs so that the skirt does not have the opportunity to collapse because it is not so highly stressed as in the Spillman construction. The fact that these slots in Spillman are put on both sides of the piston, makes the piston still worse than if the slots were put merely on one side. In the Maynard construction the horizontal separation and the vertical slot opposite that of maximum thrust, together with the web construction, gives the guide section not only flexibility but an ample strength to resist the collapse as a result of the thrust forces on the piston. The Spillman piston therefore does not have the same construction as Jardine or Maynard and it does not have the same mode of operation nor it does not give the same result. Its mode of operation insofar as the decrease in diameter of the skirt as a result of wall pressure, may be regarded as somewhat similar, but the manner in which the skirt is slotted in Spillman guarantees against successful operation, whereas the slotting, in combination with other features in Jardine and Maynard, is favorable to success.

The Master: We will recess until 9:30 Monday morning.

(Thereupon, at 9:30 A.M., Monday, March 20, 1933, the hearing was resumed.)

Mr. Richey: Defendants' counsel has asked us, in order to facilitate his policy with respect to the pistons of the Schoengarth patent, to announce our

views at this time with respect to the claims in suit of the Guliek patent, which we think, as we are at present advised, describe the 1911 piston that Mr. Guliek used in his 1911 tests, and the 1914 piston that Mr. Guliek used in his 1914 tests. Accordingly, in order to accommodate opposing counsel, we make the following provisional announcement:

The 1911 Guliek piston, claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 42 and 43; the 1914 Guliek piston, claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 38, 42 and 43.

With the consent of defendants' counsel I correct the following error which we made in the announcement of claims of the Gulick patent infringed.

We announced we were charging that claim 34 was infringed by Exhibit 3-0. This announcement should have been that we charged infringement of this claim by Exhibit 3-J. As corrected, the charge is that Exhibit 3-J infringed claim 34. We do not charge that Exhibit 3-O infringes claim 34.

Mr. Bruninga: As I understand, by the 1911 piston you mean the piston represented by Exhibit

481

Mr. Richey: No, the one that he testified it was. Exhibit 48, as I understand it, doesn't exactly conform to what he testified it was.)

Mr. Bruninga: What I had in mind, that motorcycle piston which had the circumferential ribs on it.

Mr. Richey: Well, what we had in mind in arriving at these claims was the piston that he tested in the Renault car.

Mr. Bruninga: That is all right. Now, as to the 1914 piston, it is the one represented by Exhibit 51.

Mr. Richey: It is the aluminum piston.

Mr. Bruninga: The aluminum piston represented by Exhibit 51 which was tested in the Amplex car?

Mr. Richey: I think Exhibit 51 conforms ex-

actly to his testimony, I am not certain.

Mr. Bruninga: Now, I notice that there are a number of these claims applying to the 1911 and 1914 pistons, and my recollection is not clear whether any of those are relied upon as being infringed. I mean, were all of them being relied upon as being infringed by one or more of the exhibits?

Mr. Richey: Well, we only announced the

claims in suit.

Mr. Richey: Well, that is the only purpose for which you asked that we state it, and the only purpose for which we have stated it.

Mr. Bruninga: Well, the record will show that.

I don't want to commit myself.

Mr. Richey: As I said the other day, and as the Master well knows, the claims are interpreted in the light of the prior art, and it is not fair to ask us to interpret them and ass upon the prior art, but we are willing to accommodate you, and we have. Are you ready to go shead?

Mr. Bruninga: Yes.

FURTHER DERECT EXAMINATION OF MR. JEFFRES by Mr. Richey.

Q. Doctor, do you know whether or not any efforts were made to commercialise the piston shown in the Spillman patent 1,325,176, and if so, you may state what you know about it and what the results of such an effort were, that you know was made? A. Yes, the Kant Skore Company in Cincinnati tried to commercialise the Spill-

man piston and the results were very poor.

in commerce, if you know! A. The piston when it was used in commerce, if you know! A. The pistons collapsed so in the slotted or tongue portions that they became useless or unsatisfactory in operation; also there was hard rubbing on parts of the piston bearing surfaces nearest the besses and very little bearing pressure at the thrust faces.

Q. State whether or not the use of these pistons was discontinued commercially, if you know? A. Yes, so far as I know no piston like this is being manufactured

today, nor has such been for a good many years.

Q. Was any piston substituted for it by the Kant Skore Company, and if so, what piston? A. Yes, the split skirt type of piston as characterized by the Maynard patent was generally substituted for the Spillman piston by the Kant Skore Company.

951

Q. Will you next take up the patent to La 1,395,441, and compare the piston illustrated and described therein with the piston of the Jardine and Maynard patents in suit? A. This Long piston in patent 1,395,441, is a single-walled piston with special eletting on each of the thrust faces of the skirt or guide section of the piston. On one side is a T-slot, as shown in Fig. 2, and on the other side is a complicated slotting consisting of a U, or more accurately, a rectangular shape with one side of the rectangle missing, and a vertical slot extending from the bottom of the slot to approximately the line between the two bosees, as shown in Fig. 1. From the drawings it would appear that the slot is entirely in the guide section and therefore the horizontal slots do not separate the guide section from the head section. If that is a fact the slotting can do no good because the piston would seize in the guide section just above the horizontal elot where the piston would be the hottest. Furthermore, there is no relief around the bass section, and with no relief the piston could not conform to the cylinder wall at the top of the skirt, even by utilizing distortion, because the piston would exert pressure against the entire circumference. The Long piston, therefore, does not have the guide section separated from the head section by a horizontal slot, as in Jardine, nor is there relief around the bosses in combination with the slotting, as is found in Jardine. This piston, therefore, does not have the same construction as Jardine and it does not have the same mode of operation as Jardine, and it therefore cannot give the same results as Jardine. The analysis with respect to Jardine is also applicable to Maynard. The Long piston does not have the same construction as Maynard, nor the same mode of operation, nor can it give the same results.

Q. Will you answer the same question with respect to the Long piston shown and described in the Long patent, 1,489,499? A. This piston is a double-walled piston, as shown clearly in Fig. 5, which is a cross section through the bosses. It has a complicated set of slots, shown in Figs. 1, 2 and 3. The slotting on one of the thrust faces, as shown in Fig. 1, is rectangular, with one of the sides of the rectangle missing. It may be described also as one horizontal slot with two vertical slots extending one from each end of the horizontal slot to the bottom of the skirt. This is the side which is double-walled, as is shown in both Fig. 4 and Fig. 5. The other thrust face is slotted with one horizontal slot and two

vertical slots, which connect the ends of the horizontal slot but do not go down to the bottom of the piston skirt. This piston does show a horizontal separation between the guide section and the head section. This separation is clearly abown at numbers 11 in Figs. 1, 2 and 3. There is, however, no boss relief in combination with the slotting. The piston in my opinion would have a certain degree of wall or skirt flexibility in operation. As compared with Jardine the construction is different, as can be clearly seen. Jardine has in one of its constructions a double wall at the head of the piston but in neither of his constructions does it have a double-walled skirt section. In one of the Jardine constructions there is no double wall in any portion of the piston. So from the standpoint of a double-walled skirt section, the Jardine construction is different from that of Long. Jardine has a simple system of slotting, as opposed to Long's complicated system of slotting, and Jardine uses boss relief in combination with horizontal and vertical slotting, which is not found in Long. The mode of operation of Jardine is therefore different from the mode of operation of Long, and the result is also different.

The Long construction is not like the Maynard construction. In the first place Maynard shows nothing but a single-walled structure. The Long construction does not have the combination of flexible webs and horizontal and vertical slotting with relief, as shown in the Maynard patent. The mode of operation of Maynard therefore is different from the mode of operation of Long, and the result is also different.

Q. You are asked the same with respect to the Long patent 1,872,772! A. This construction is a complicated one, having double-walled sections around each of the bosses of the skirt section. The piston, when completed, has two horizontal slots and six vertical slots, each of the six vertical slots connecting the horizontal slot with the bottom of the piston. The horizontal slot does also in this patent separate the head section from the guide section, as is shown by the numbers 12 in Figs. 1, 2 and 3. The drawings show no relief around the bosses, so that there appears to be no combination of horizontal and vertical slotting with boss relief in this patent. The construction is clearly different from that of Jardine, both in the double-walled nature of the skirt and in the system of slotting and the absence of boss relief. The mode of operation of the Long construction is quite complicated but no doubt a certain amount of flexibility is gained in the skirt section as a result of the web construction and the series of slots. The mode of operation, however, is different from that of Jardine and the result is also different. This is true also of Maynard. The construction is clearly different from that of Maynard and the mode of operation is different and the result is also different.

Q. Now, would you supplement your last answer by including the same comparison of Exhibits E and F with the Jardine and Maynard patents? A. Exhibits E and F appear to be similar to each other, with the exception of the ribbing inside the piston head. This ribbing would appear to make little difference in the general construction, mode of operation or results of the Exhibits E and F, so I can, for the sake of brevity, compare piston Exhibit F with the Jardine and the Maynard constructions.

Exhibit F is a double structure with the six vertical slots and two horizontal slots, as described in the Long patent just previously discussed. The horizontal slots appear to separate the head section from the guide section. There is also relief around the bosses in Exhibit, F which was not described in the Long patent itself. This relief around the bosses would, in my opinion, make the piston function better than without such relief and would bring the mode of operation of this Exhibit F nearer to that of Jardine. The mode of operation, however, would still be different because of the double-walled nature of the skirt and the complicated system of webs and slotting. The result, insefar as functioning, would somewhat simulate that of Jardine, but the piston would be much more expensive to manufacture and it would be heavier and would therefore not give the complete results of the Jardine construction. This particular piston head shows that the side opposite from the one bearing the exhibit tag, has collapsed in service. The gases have been blowing clear by the piston, as shown by the excessive carbon deposits at the bottom of the skirt under that boss. There has also been some collapse apparently in one of the thrust face sections, as shown by the carbon accumulation on it. There has also been fairly hard rubbing on one or the other thrust faces just opposite the end of one of the cross webs. So that, apparently, this particular piston did not function properly in service. As compared with the Maynard construction, the

Maynard and the mode of operation, even though the relief is present in Exhibit P around the bosses, is different from that of Maynard, and the result is different. One of the differences between Exhibit P and Maynard is in the nature of the bottom of the skirt. The bottom of the skirt in Exhibit F has six openings in it as compared with one in Maynard. It can be seen by examining Exhibit F that the carbon deposit is found in each one of the six vertical slots. So that the result obtained with Exhibit F is inferior to that obtained with Maynard.

Q. There is some testimony in this record to the effect that Long pistons were used by the Franklin Company commercially. State, if you know, who made the castings that were employed in the manufacture of these Franklin pistons? A. I don't know who made all of the castings, but I know the Aluminum Company of America made castings for the Franklin Company over a considerable period of time.

Q. Do you know when that period began? A. Well, I don't know, not from the standpoint of making a record of it, but I think it was some time along 1920 or

thereabouts to about 1926.

Q. One of those pistons bears the name of Levett, Exhibit E? A. Yes, Exhibit E does.

Q. And who was Levett? A. Levett was a manufacturer of pistons and other aluminum castings.

Q. Is that the Levett that was referred to as formerly a licensee under the patents in suit! A. Yes.

Q. This piston also bears the following notation: "Pat. 3-4-19." That is the date of the main process patents which you were asked about formerly in this case, isn't it? A. Yes.

Q. Are you familiar with any of the activities of the Aluminum Company of America in its work in connection with this Franklin piston made after these Long designs? A. I don't know that I understand quite what you mean.

Q. (Question read by reporter.) A. Well, I am familiar with quite a number of things that happened.

Q. Just state in a general way what these activities were. A. Well, the Aluminum Company didn't like to manufacture this piston, for one thing, because it is a difficult piston to manufacture in a permanent mold, but various other designs were submitted to Franklin and some time along about 1926 they adopted the Invar Strut

piston, which became standard at that time and is stand-

ard with Franklin at the present time.

Q. Will you next take up the British patent to Hives 140,988, and compare it in structure, mode of operation and result with the piston shown in the Maynard patent in suit? Will you look at the original copy of this patent instead of using a photostatic copy. A. The Hives piston is the trunk type piston divided into a head section and a skirt or guide section. The division between the head section and the skirt section being at one of the grooves containing some oil holes, the oil holes being designated as 'da''; the groove itself is designated "d1." The fact that the oil groove "d'" separates the head section from the guide section is clearly evident by placing dividers across the head section and then noting that the same setting of the dividers does not encompass the diameter of the skirt section. Therefore the T-slot. which is found in the Hives construction, is entirely in the guide section. The horizontal separation is far enough below the separation between the guide part and the head part to prevent the flexing of the piston in the flexible portion from functioning property or satisfactorily in a motor. If the piston were given the proper clearance for the top of the skirt, the T-alot would have no opportunity to do any good by flexing. There is a suggestion that one part of the skirt may be ground oval. This is included in the paragraph beginning line 32, of page 1; there are two slotting constructions suggested, one being a T-slot and the other an H-slot, and if the T-alot is used the part to be ground oval would be from the horizontal slot A downward to the bottom of the skirt. If the H-slot is to be used, the eval grinding would be between the two horisontal slots, in accordance with the paragraph to which I have referred. The drawing in cross section, as shown in Fig. 2, indicates by measprement with dividers that the skirt is somewhat oval on the section given. The larger diameter, however, is across the bosses, where it certainly could do no good in this particular piston. I think it would make very little difference where the oval had its greatest diameter, however, because the piston would not function properly as a flexible akirt unit anyway, as compared with Maynard. In the first place, the main construction is different in that the Hives pisten is the regular trunk type piston with no relief around the bosses. The Maynard piston consists of the head section with webs relieving

the skirt in the boss section, and a full diameter skirt at the bottom, the head section and guide sections being divided into two parts by the horizontal slots, and the skirt portion being flexible by joining the horizontal slots with the bottom of the piston in one of the thrust faces. The Hives piston showing no horizontal separation at the division between the guide section and the head section, is, therefore, entirely different in construction from the Maynard construction. The Hives construction has a different mode of operation from that of Maynard and it could not give the same result as Maynard.

Q. You said that the long axis of the oval ellipse was along the bosses in the Hives patent. Upon what do you base that statement? A. On measurements made with dividers on the drawing in the certified copy of the

Hives patent.

Q. And who made those measurements? A. I made

the measurements.

Q. Would you take this copy that has been offered in evidence and measure that also? A. (Witness complies) The same is true of the copy which has been offered in evidence.

Q. Will you now look at Defendants' Exhibit 3-Q. which is said to be a Franquist piston, modeled after the piston shown in the Franquist patent 1,153,902, which you discussed in your prima facie testimony. The defendants' expert suggested certain changes in this piston which are as follows: (Record 737) "The walls of this piston and the slots may be made thinner, the length of the slots could be increased, which would increase the lever arm and make the slots more flexible. Q. And what would happen if you cut all the way through a slot on one side of the wrist pin, one on either side? A. That would make that side of the skirt adjacent to this cut very flexible." As I understand it there are three proposed changes. Will you take up the Franquist patent, as modified in each of these ways, and compare it in structure, mode of operation and results, with the patents in suit? You may use any sections of the F-anquist piston which you have cut out, in answering the question.

Mr. Bruninga: I don't want to make any objection to this witness again going into the Franquist patent and models which were fully discussed on prima facie, but I simply want to reserve my right to offer surrebuttal evidence later on.

Mr. Richey: The facts are these: he asked him about the Franquist patent in prima facie cross examination. I objected to it as improper. And then we went into it and defendants' expert came along and proposed to modify the Franquist piston in three different ways. Now, I have asked the widness to compare the piston thus modified.

The Master: I think I understand the situa-

(Short recess taken.)

Mr. Bruninga: I also want to make an objection that the plaintiff in this case is estopped to deny the operativeness and utility of the structure of the Franquist patent 1,153,902, and is estopped to deny that it covers and even discloses the subject matter of the main piston involved here, which is Plaintiffs' Exhibit 1. I want to at this time hand the Court the printed record in 6264, the Cleveland Trust Company and Chrysler Corporation, appellants, vs. the Simmons Manufacturing Company, which is now pending in the Circuit Court of Appeals for the Sixth Circuit. I stated before I was going to get a copy of this and substitute it for one of the papers in this case.

The Master: Is this my copy now!

Mr. Brutinga: That is your copy, your Honor. Mr. Richey: Are you offering this in evidence

or marking it in evidence?

Mr. Bruninga: Yes, I will find out later on. I will mark it for identification later, just as soon as I can get the list of exhibits because I want to substitute it for one of the papers in the file that I offered in evidence.

Mr. Richey: The sections which the witness has produced I mark for identification 71-A and 71-B.

A. Taking the first suggestion of Mr. Stellman to make the walls of the piston thinner and the walls of the ribs thinner to gain flexibility, it is my opinion that if the walls are made thin enough to produce useful flexibility, the mechanical strength of the piston would not be great enough to withstand the stresses imposed during service. The second suggestion that the ribs be extended in length, that is, axially, toward the vertical axis of the piston, would to my mind also be ineffective in producing flexibility because the extension of these ribs towards the axis would continue to add an element of

rigidity which would defeat the desired results. There is, furthermore, a physical limit on the extension of the ribs axially because of the needed room inside the piston skirt for the connecting rod connection, and operation. Such a construction would also add to the difficulty of making such a piston, to its weight and to its cost. I do not believe, however, that the added flexibility would result even if the ribs were extended axially. The third suggestion that the slot be extended completely through one of the ribe on each side of the piston, would not produce the desired result, in my opinion. There would be in that case one diameter of the piston which would be rigid and hard robbing and eventually seizure would occur across this rigid diameter. Immediately adjacent the completed slot one of the skirt surfaces, that is the skirt surface on one side of the slot, would be quite flexible, and the skirt surface on the other side of the slot would be rigid. None of these changes, to my mind, would therefore make the piston, as modified, the same construction as that of any of the patents in suit, and the mode of operation would be different and the result would be different

I have here two parts of a piston of the Franquist type, which piston was given to me by Mr. McCoy. In order to get an idea of the flexibility of the skirt portion as a result of the slotted ribe described by Franquist, I nad the head portion separated from the skirt portion. The head portion is marked 71-A, and the skirt portion is marked 71-B. The skirt in this piston would appear to be somewhat thinner and the rib walls thinner than in Defendants' Exhibit 3-Q. The head, when it is attached to the skirt, has a very powerful tendency to keep the skirt from flexing. To obtain the flexibility of the skirt itself it is therefore necessary to separate the skirt from the head. It can be readily seen that even the skirt itself of the Franquist construction is very rigid, simulating the stiffness of a trunk type piston.

Mr. Richey: I offer the two piston parts referred to by the witness and which were marked for identification Plaintiffs' Exhibits 71-A and 71-B in evidence by those numbers.

The Master: If there is no objection they may

be received.

Mr. Bruninga: With the same reservation and the same objection.

The Master: With the same reservation.

Q. Have you a section of the Maynard type of piston similar to 71-B, by which you can show the differences in the operation between the two? A. (Witness produces same.)

Mr. Richey: I ask that these two parts be

marked for identification 72-A and 72-B.

Mr. Bruninga: With the same reservation and the same exception.

The Master: They may be received with the

same reservation.

A. I have here a Maynard type piston which has been cut into two parts, the separation in this case being made in the skirt section proper, immediately below the horizontal slot. The great flexibility of the skirt section itself can readily be seen or determined by hand flexing.

Mr. Richey: I offer in evidence Plaintiffs' Exhibit 72-A and 72-B the parts so marked for identification and referred to by the witness in the last preceding answer.

Mr. Bruninga: Same reservation and same ob-

jection.

O. Will you next take up the Ebbs patent 700,309, and compare the piston illustrated and described therein in structure, mode of operation and result, with the pistons of the patents in suit? You might supplement your answer by making the same comparison with the piston which is illustrated in Defendants' Exhibit 4B. A. In the first place this Ebbs piston is a composite piston; it is very complicated in construction. The complicated construction, according to the patent, is resorted to for the purpose of making the skirt part replaceable rather than discarding the whole of the piston. In order to make the skirt part replaceable it is divided into two halves, "f". The putting on of these two halves makes a horizontal separation between the head section and the skirt section, and the halves are necessarily divided in such a manner as to make in the skirt, when assembled, two vertical separations which appear in construction to be slots. In that broad sense the piston has a horizontal . separation and a vertical separation. The horizontal separation, however, has no function, at least, in flexing, nor do the vertical separations have any function whatsoever in producing flexibility. The skirt of this piston must be arranged in such a manner as to provide full clearance when the piston is in operation. This is pro-

vided beyond any doubt by the construction itself. There is a cross-bridge construction inside the skirt of the piston which holds the connecting rod. There can be nopossible reduction of diameter by flexing or distortion across the thrust faces. The vertical slots in this piston are therefore not in the thrust faces. These vertical slots are perpendicular to the thrust faces. The region at the ends of the structure holding the connecting rod will be hottest in the piston described. Heat will be conducted from the piston head through the rod "d" to the connecting red support. From there it will be conducted to the skirt so that the hottest part of the skirt would be at the ends of the connecting rod support. There is no relief shown in the region of the thrust faces or in any manner which would make it possible to operate the piston at less than the normal full clearance to operate a completely solid piston. The wall sections are such that even if flexibility could be utilized to compensate for extra expansion, the structure would be quite rigid. The Ebbs construction, therefore, in addition to being very complicated, is one in which the mode of operation is essentially that of a solid, rigid, non-flexible type piston. There is no mention in the patent that the skirt is supposed to be flexed, and there is no mention that the skirt can be fitted closer than with a conventional type of piston. This Ebbs construction, therefore, adds nothing to the flexible skirt type of piston. Its construction is wholly different from that of any of the patents in suit; its mode of operation is that of a solid and rigid skirt miston, and its result is that of the solid or rigid type of piston and not that of the flexible skirt patents in suit.

Considering the so-called modification of the Ebbs patent as shown in Fig. 4-B, the modification is apparently made in order to bring the vertical separation of the two skirt halves into the thrust faces instead of at right dugles to the centers of the thrust faces. If the construction in Exhibit 4-B is made, there would be some possibility of the vertical slots functioning, if they could do any good, and if the sections were made proper for flexibility; but there is no justification in the Ebbs patent for placing the vertical separation in the thrust faces, and, furthermore, there is no possibility that such a construction, even as modified in Exhibit 4-B, could function as a flexible skirt piston. Again, the rigid cross member supporting the bosses would be non-deformable. and there is no boss relief shown, so the full clearance of the skirt must be provided in the boss diameter of the figure 4-B. Even after such a piston were constructed, it would be of no use whatsoever. No one would think of constructing a piston like is shown in 4-B for commercial operation in these days; the expense would be unsatisfactory, and the functioning of the piston would be at least no better than that of the trunk type piston. The whole Ebbs disclosure, it seems to me, has no bearing on any of the patents in suit.

Mr. Brunings: I want to object to this witness' answer on the following grounds: here, again, plaintiff is estopped to take the position that the Ebbs patent does not disclose anything of the patents in suit, or that it has no flexibility, or that the vertical slot has no function at all. The law examiner's decision in the interference in which the Gulick patent was involved distinctly established that there was no invention in a splitting of the Spillman & Mooers patent structure in view of the Ebbs patent. Now, there was no appeal taken from that decision; the claims were deliberately cancelled by the owner of the patent.

Mr. Richey: Not the claims in the patent, of

course.

Mr. Bruninga: The claims rejected by the law examiner were deliberately cancelled, so that establishes a condition of estoppel, and this witness is now taking the position just contrary to the position of the Patent Office, which was not appealed from at all. I just want to make my objection at this time.

The Master: Objection will be noted.

Mr. Richey: Of course we challenge all that.

Q. Will you next take up the Chenard & Walcher patent 468,595, and compare that in structure, mode of operation and results with each of the patents in suit? You can use the translation that has been offered in evidence with the Chenard & Walcher patent. A. This Chenard & Walcher patent refers to a piston with a horizontal separation only between the head section and the guide section. It is stated in the patent that it had been the practice previously to grind the cylinders in a special way to accommodate the method of expansion of the piston. This was done on a special copying lathe and was not a simple machine shop operation. It is also stated that by this invention it is made possible to machine the skirt of the piston in the ordinary lathe. That

means that the machine ground and need not be bothered with the technique of the special shapes obtainable with the copying lathe. The means for producing this is a e secially designed piston with connectors running directly from the flat of the head to the bosses, so that the skirt can be entirely separated from the head portion horizontally. In this way it was hoped that the heat would pass from the head directly down to the boss region and by pass the top of the skirt section, thereby keeping the skirt cooler than would obtain with a piston having the head section attached to the skirt section at its periphery. There is not any evidence in the patent specifications nor in the drawings that a flexible skirt was contemplated. In fact, everything is in the direction of having a non-flexible skirt which is supposed to operate better because it is kept cooler. The piston shows no relief of the skirt section around the bosses or any place else. In other words, the skirt is supposed to be eylindrically finished. This piston being a non-flexible type piston has a different construction from Gulick. Jardine and Maynard, a different mode of operation, and gives different results. It does not embody the Mooers principle because there is no relief in combination with the horizontal slotting. It does not embody the Schmiedeknecht invention because the nature of holding the bosses, and the bottom skirt regions, is different from the Schmiedeknecht construction.

Q. Would you make the same comparison between the piston disclosed in the Chenard & Walcher patent and this Ray Day piston of Plaintiffs' Exhibit 81 A. The general construction of the Chenard & Walcher piston is quite similar to that of the Ray Day piston, with the exception, of course, of the vertical slot in one of the thrust faces of the Ray Day piston. This vertical slot not only changes the construction but it changes the mode of operation and results of the piston. There are, however, some other differences. Chenard & Walcher apparently desired a rigid piston. Their construction is rigid. The rib or ribs across the head, is in the direction of rigidity. It is not clear from the drawing how many ribs there would be across the head, but in any event the rib or ribs would militate against the flexibility of those webs. Furthermore, the construction of the web section, according to one of the paragraphs in the patent, could be annular in the Chenard & Walcher; in this case the construction would be quite different from that of the Gulick piston, Plaintiffs' Exhibit 8.

There is also a horizontal rib at the bosses in the Chenard & Walcher construction, as shown in Fig. 2, the extent of which is uncertain from the drawing, and I think quite unobtainable from the drawing. At least, I see no possible way of arriving at the vertical thickness of the rib shown around the bosses in Fig. 2 of the Chenard & Walcher patent.

Mr. Richey: Marked X on the Chenard &

Walcher patent in evidence.

The Witness: In the Ray Day piston, Exhibit 8, there is also generous bose relief which is not found in the Changri & Walcher patent or drawing. So that the Ray Day piston, Exhibit 8, has a different construction, different mode of operation, and gives a different result from the Chenard & Walcher construction.

Q. Will you next take up the patent to White 1,495,936, and compare that with each of the patents in suit in the same way? A. This patent appears to deal with a very specially constructed piston, in which the wrist pin of the connecting rod shifts during the stroke. The design apparently was made so that the shifting wrist pin takes most of the load and a centrally designed wrist pin takes none of the strain due to the shifting of the position of the rod. I cannot see where this patent has any bearing on the patents in suit at all; a very complicated piston wrist pin arrangement; I never heard of its being used any place. I don't see any arrangement for flexing the skirt or anything of that sort. I don't see where the patent has any bearing at all on the patents in suit.

Q. Will you next answer the same question with respect to the piston illustrated and described in the Anderson patent 1,283,021, making that comparison with respect to Gulick, Jardine and Maynard only! A. This Anderson piston is what might be described as a skeleton type of piston, or slipper type of piston, in which the slipper surfaces are not separated from the head section, that is, the piston has no horizontal slotting and has no vertical slots. It is, therefore, not a flexible piston and has different construction and a different mode of operation, and gives a different result from either Gulick, Jardine or Maynard.

Q: Now, will you next take up the French patents to Serex, 434,147 and 16,362, and compare the disclosures therein with each of the disclosures of the patents in

suit? A. Considering both of these Serex French patents together, the part I believe that was stressed by Mr. Stellman was the valve piston, and particularly the horizontal and vertical slotting in such valve piston, as shown in Figs. 1 of both of the patents. In the first place. these valve pistons are not pistons for internal combustion motors in the sense that the patents in suit are. The pistons do not have a head section separated from a skirt section by a horizontal slot. The pistons are relatively light, not requiring the strength of a piston which must impart the explosion force to the operating mechanism of a vehicle. The slotting in this case is made in place of the rings, apparently. There appear to be no other rings to seal the wall between the piston and the cylinder. In the patent 16,362, Fig. 1, it is clear that even the horizontal separation comes below the boss. there is only a small portion of this piston slotted two ways to make it serve as a spring ring in the valve piston. There is no combination of horizontal and vertical slotting and relief. The main body of the piston is apparently fitted to run fairly snugly in the cylinder. These patents do not represent the construction of the flexible skirt patents in suit; they don't operate like the flexible skirt patents in suit; and they don't give the results of the flexible skirt patents in suit.

Q. Will you next take up the British patent to Fairy 12,772, of 1914, and make a comparison with the disclosures in the Gulick and Schmiedeknecht patents! A. The Fairy construction is apparently that of a composite piston, where the head and skirt portions are made in one piece, and the boss connection is made in another piece and riveted or otherwise attached to the skirt of the piston. There is no horizontal separation or vertical separation, so the piston does not have a flexible skirt. It has no bearing, as I see it, therefore, on the Gulick patent in suit. Insofar as the Schmiedeknecht patent is concerned, the Schmiedeknecht patent is an integral structure, as opposed to a composite structure. In that sense the two structures are different, and the boss section seems to be entirely supported on the riveted in webs in the Fairy patent, whereas the boss in Schmiedeknecht is supported in part by the web and in part by the skirt near the head section in the Schmiedeknecht construction. The Fairy patent, as I see it, therefore, has

no bearing on the Schmiedeknecht patent.

Q. Will you next look at Figs. 3 and 4 of the British patent to Pugh, 17,256, and the descriptive matter refer-

ring thereto, and compare the disclosure thereof with the pistons disclosed in the Gulick and Schmiedeknecht patents in structure, mode of operation and results? A. This is a built-up piston, almost of tin can construction. The Pugh piston in my opinion would not function satisfactorily in a metor anyway on account of the thinness of the various sections, and because there would be no adequate bearing in the head portion. The piston is also a double-walled one, in the head section, and to an extent around the bosses. The Pugh construction is therefore different from the Schmiedeknecht construction and it would also operate differently and give a different result.

Q. I now hand you a piston which I have marked for identification Plaintiffs' Exhibit 73. State what that is, if you know. A. I believe that is one of the Ricardo type pistons which was discussed in my prima facie examination relating to the tests on Ricardo type pistons in the laboratories of the Aluminum Company of Amer-

ica.

Mr. Bruninga: I don't want to object to this. I think it was brought up on prima facie, but I again want to make a reservation that I may want to ask for surrebuttal testimony on this.

The Master: Same ruling on that.

Mr. Richey: Of course his position is this: he discussed these Ricardo pistons with his experts and now we are answering him.

Mr. Brunings: Yes, but I asked particularly about the production of some of these pistons on

prima facie and they weren't produced.

Mr. Richey: I offer that in evidence as Plain-

Q. Is that like any of the pistons shown in this Defendants' 3-S1 A. It is approximately like Fig. 2 in Defendants' Exhibit 3-S, with the exception that Fig. 2 has some ribbing in the head which is not found in Exhibit 73.

(Thereupon, adjournment was taken to 1:30

(At 1:30 P. M., same day, Monday, March 20, the hearing was resumed.)

Q. I next call your attention to the Venner piston illustrated in Defendants' Exhibits J and K, and ask you

to compare that in structure, mode of operation and results with the pistons shown in the Jardine and Maynard patents in suit! A. The drawing in Defendants' Exhibit K is somewhat different from that shown in Defendants' Exhibit J, especially in the web construction. but the differences appear to be of minor importance. I can, therefore, disones Exhibit J as representative of both exhibits. This piston is double-walled in both the head section and the skirt section. There is a partial horisontal separation between the head section and the guide section. The piston has no relief around the bosses or on the skirt section, so in that respect the construction is different from both Jardine and Maynard. As I view the Venner construction, there would be little if any flexibility across the thrust faces. The side walls of the skirt would have some flexibility, especially at the bottom. but the rib construction is such as to militate against even the flexibility of the side sections of the skirt. Insofar as the Venner piston is double-walled in both the head portion and the skirt portion, it differs decidedly in construction from both Jardine and Haynard. The combination of horizontal and vertical slots, properly placed in a guide section, with relief, as found in both Jardine and Maynard, is absent in Venner. The mode of operafrom both Jardine and Maynard, and the results would be different.

Q. In your discussion of the Meanhmeier pisten you gave some dimensions in reference to those pistens. Have you produced drawings showing those impensions? A. Yee, I have two drawings, one showing the dimensions superimposed on the Monthmeter cast in piston, and the other the dimensions superimposed on the Monthmeter cast in the Monthmeter aluminum piston, Defendants Exhibit 3-W.

Mr. Bichey: The drawing showing dimensions on Defendants' Exhibit 3-V is offered in evidence as Plaintiffs' Exhibit 74, and the drawing showing dimensions on Exhibit 3-W, is offered in evidence as Plaintiffs' Exhibit 75.

Q. At page 840 of the record, Mr. Stellman, defendants' expert, testified as follows: "Yes, I should say that not every feature in each patent in suit, was covered by any one patent which I might have picked out." Do you agree with that statement or not? A. I agree with it,

Q. Mr. Stellman produced a vector diagram, Defendants' Exhibit 4-A, and discussed the same in connection with the operation of the piston like Exhibit 1. Will you take that diagram and state whether or not you agree with Mr. Stellman, and if not, state your reasons! A. Defendants' Exhibit 4-A is a drawing showing a cross section of Plaintiffs' Exhibit I type of piston, just below the herizontal separation between the head portion and the guide portion. As I understood Mr. Stellman's testimony, the effect of the various forces on the piston at point A. Defendants' Exhibit 4-A, would be such that this point would have no flexibility. In order to ascertain the facts, I had a piston similar to Plaintiffs Exhibit I cut in two on the section represented in Defendants' Exhibit 4-A. When the piston is separated in two parts in that manner, it is clearly seen that the whole of the skirt section becomes very much more flexible in the detached state than it is when attached to the head of the piston. From rather rough measurements which I made with the help of some bathroom scales, it indicates that the flexibility of the bottom of the skirt of a piston like Exhibit 1 is only one fifteenth as great with the skirt attached to the head in the manner of attachment in Fig. 1 as when the skirt is detached from the head as shown in Exhibits 72-A and 72-B, particularly 72-B. In other words, it takes 15 times as much pressure applied on the bottom of the skirt to close the alot in Exhibit 1 as it does in the detached skirt Exhibit 72-B. This shows the tremendous effect of one part of a piston on other parts, especially in these flexible type pistons. In the head portion containing a small part of the skirt section, in Exhibit 72-A, the flexibility of the skirt portion can then be readily demonstrated by pressure of the two thambs on the alot-ted portion. This shows beyond any question that the skirt portion, even though it is attached to the head portion, has flexibility resulting from the combination of vertical and horizontal slotting. I found it possible in a piston which was supposed to be similar to Plaintiffs' Exhibit 1 to flex the webs at point A in Defendants' Exhibit 4-A merely by applying pressure on the bottom of the electronic control of the elect the skirt with one hand. If have a micrometer on Plain-tiffs' Exhibit I now across the two points corresponding to A. The diameter across the two points is 2.6085", ap-proximately. If someone will turn the micrometer acrow while I press on the bottom of the skirt. (This is done.) The reading at the present position appears to be 2.6085.

I will now press on the bottom of the skirt, merely with one hand. The reading on the micrometer as it was turned up while I was pressing is 2.595. That is a considerably greater deflection than I was able to effect on the other piston so I think it would be well for me to check it. I will make a new measurement across the point A without flexing. The measurement I obtain now is 2.6070. Now if some one will turn the micrometer wheel, while I—(This is done.) After I flexed the bottom of the skirt with one hand, the reading is 2.595". That is still considerably more flexibility than I was able to obtain on the other piston. I am afraid in screwing this zp, you may have taken hold of the smooth part of the handle. (The one who assisted the witness): I did in both cases.

The Witness: Well, I only took the knurled part of the h dle. The smooth part is attached rigidly to the micrometer, and the knurled part is attached movably to the micrometer; that is the difference. Now, the diameter in the unsprung state is 2.5985. So, if someone will turn the ratchet new, taking hold of the knurled part only (ratchet turned by Mr. Richey). Now the reading, after turning the micrometer up in the sprung position is 2.592. That is more in line with the amount that I was able to spring the other piston supposed to be similar to Plaintiffs' Exhibit 1.

There is another way of demonstrating the movement of the webs at the point A in Defendants' Exhibit 4-A. I just fastened the micrometer across the point A in Exhibit 4-A and screwed it tight enough so that its own pressure against the walls of the web would hold the weight of the micrometer by gravity. Then by taking hold of the bottom of the piston and springing it with one hand, the micrometer dropped off of the piston. Both the measurements and the tests just described demonstrate clearly that in Exhibit 1 itself there is measurable flexibility of the webs at point A in Defendants' Exhibit 4-A.

In this connection I should like to mention also the horizontal slot in Plaintiffs' Exhibit 1 is not put in in quite the same way as the horizontal slot in the Maynard patent drawing. The horizontal slot in Plaintiffs' Exhibit 1 is put in by a groove tool so that the web is cut on the bias or at an angle. In the Maynard patent drawing the horizontal slot is cut more nearly straight through the webs. As shown in the Maynard Fig. 1, for example,

the web flexibility would probably be more than in Plaintiffs' Exhibit 1, varying, however, merely in degree. The turning in of the webs at their outer ends in Plaintiffs' Exhibit 1 makes them more flexible in the thrust direction than the webs shown in the Maynard patent. So the flexibility of the webs at the top of the skirt in the Maynard patent, in my opinion, would be very appreciable and certainly enough to function in a helpful way in the operation of the piston. The amount of flexibility found by micrometer measurement just now is considerable from the standpoint of piston clearance, which is measured in thousandths of an inch and some times in tenthousandths of an inch.

Mr. Bruninga: I want to make the same reservation with reference to Exhibit 1 as to its flexibility, as already made to some of the questions. This matter was also discussed on the prima fade proof and most of this witness' answer is simply an accumulation or new argument to what he said before rather than a plain rebuttal of this Exhibit 4-A.

The Master: The same ruling on that. We

will pass on that.

Mr. Richey: Pass on that when we come to it.

Q. Doctor, have pistons of the Maynard type without this relief shown at A been used commercially, and if so, in what quantity?

Mr. Bruninga: That, your Honor, was fully covered on prima facie. If you have some new angle on it—

The Master: Let him answer.

Mr. Richey: I can tell you what the difference is, if you want to know.

A. Yes, they have been used commercially and in large quantities, say in the hundreds of thousands.

Q. Will you compare this Exhibit 3-J in structure, mode of operation and result with the Gulick patent in suit, considering that the slit in Exhibit 3-J is cut through at both ends, in answering the question? A. This Defendants' Exhibit 3-J is, I think, a piston for the Ford V-8, 1932 model. It is quite a refined piston, both from the standpoint of its design and its final preparation for use in a motor car. It has a flexible skirt, when the vertical slot is completed, and the piston is divided into two main parts, the head part and the skirt or guide part, by a horizontal slot at the top of one of the thrust

faces. This combination of horizontal and vertical slots. the horizontal slot separating the head section from the guide section, will function the same as the combination of horizontal and vertical slotting in the Gulick construction. This piston, Exhibit 3-I however, has not only boss relief in combination with these other things, which is not found in Gulick, but the piston is also cam ground; that is, the machining of the piston in the plant before it is put into the car is quite special. The piston therefore. embodies features not described in Guliek, but which depend for its successful operation on the combination of horizontal and vertical slotting, the horizontal slot separating the head section from the guide section, and thereby gaining flexibility of the skirt section, in so far as the skirt is flexible as a result of that combination, and Defendants' Exhibit 3-J has a mode of operation similar to Gulick and would obtain the same results as Gulick.

Mr. Bruninga: Same reservation as to surrebuttal.

The Master: Same ruling.

Q. Look at Defendants' Exhibit 3-O and compare that with the Gulick patented piston and the Mooers patented piston. A. Defendants' Exhibit 3-0 is also a rather refined piston. It is I believe, a piston for the Plymouth 1932 six-cylinder engine. This piston has a norizontal separation of the head section from the guide section on one thrust face. It also has a vertical slot connecting with the horizontal alot and combining with it in such a manner as to produce flexibility of the skirt section, especially at the top of the shirt where flexibility is most needed. The slot in Defendants' Exhibit 3-0 does not extend to the bottom of the skirt. The skirt, however, is ground oval from the top to the bottom. The piston can be fitted so that the minimum clearance between the piston and cylinder is less than in a piston containing no slot. This is true at the top of the skirt because the combination of horisontal and vertical slotting permits some flexibility of the skirt and because the skirt is ground eval at the top, which permits of some distortion of the piston to compensate for excessive expansion, and also because the vertical slot is not completed, the portion of the top of the skirt immediately above the bosses becomes hotter than the portion adjacent the horizontal slot, and as a result of that the Mo principle is brought into play to help change the piaton from an oval shape to a round shape without exerting

presspre against the wall of a cylinder. That is the Mooers force tending to distort the piston is a force inside the piston itself, as a result of horizontal slotting and relief and differences in temperature between one part and another part of the piston. The Mooers principle would also apply at the bottom of the skirt to an extent as well. So that there is a force inside the piston itself tending to change the eval shape to a round shape without exerting extra pressure against the cylinder wall. Those are the reasons that I gave for saying that this piston is a rather refined piston. It is simple in its wall structure and rather complicated in its final finishing, in so far as the relations between horizontal and vertical slots and oval grinding are concerned. In so far as the top of the skirt is made flexible by this combination, this piston has the mode of operation at the top of the skirt of Gulick. In so far as the Mooers principle tends to change the oval shape to a circular shape, it has the mode of operation of Mooers. So that I should say the piston, although it embodies additional features over Quick and over Mooers, it also embodies the Gulick features and the Mooers features.

Mr. Bruninga: Same reservation, your Honor.
The Master: Same ruling.
Mr. Bichey: Direct examination closed.

Cases Examination by Mr. Brunings.

Q. Is it your idea that the question whether a test is made for experimental purposes, is a matter of the intention of the party who makes the test! A. Well, I wouldn't say that would be true entirely, at any rate. It might have some bearing on it. I don't know as there is an accurate definition of what is an experimental test and what is a test for further purposes. What one person would regard as still experimental, another one might regard as beyond the experimental stage.

Q. That is really an arbitrary matter, isn't it? A.

To quite an extent it is.

Q. You also state that the length and duration of the test depended upon the change that has been made in the structure? A. Yes, that is one factor that has to be taken into consideration.

Q. In other words, if no substantial change has been made between one test and another, you would still consider that the first test has not been completed and

should be made over again in order to test out the particular structure? A. Well, I don't know exactly what you mean. Perhaps you can give me an example of

what you mean.

Q. Well, if you take a piston having a certain construction and a test has been made for a certain period, and then a second test is made on another piston which don't differ in structure or mode of operation at all from the first one, would you still consider the second test an experimental test? A. Oh, it might be, yes. I would like to see the differences which you have in mind between the two structures.

Q. Well, in structures such like pistons that are changes in design and in thickness of material and strength of certain parts, or putting a web here, or putting another web there, those changes are made continually by motor manufacturers, aren't they? A. Well, that is pretty general. Some times a change which appears considerable can be put in without really changing much of anything; and another time a change which appears to be minor is the difference between success and failure.

Q. There is a difference in pure design and the development of a new construction that is generally recognized in the engineering art, isn't it? A. That is a

change of an old design?

Q. There is a difference between a design of, say a piston having a certain construction or a certain diameter, or for another diameter, and a development of the new structure? A. Some times there is, although change in diameter is a very important change in certain applications to pistons.

Q. Well, take the Oakland piston, that is a small

piston! A. Yes.

Q. And the Ford piston was a larger piston? A. Yes.

Q. Do you know which same first in the structure of the character of Exhibit 11 A. Yes, the piston more like the Ford piston; that is the Maxwell piston, which is more like the Ford, four-cylinder engine viston.

Q. Let's take Exhibit 1, the construction which you said simulated the Maynard patent; can you give me two pistons of different diameters that were used in cars around between 1922 and 1926? A. Yes, I think so. The Oakland as one and Maxwell another.

Q. They were of the same construction as far as simulating the Maynard patent was concerned, were they

not? A. Yes, generally, although the Oakland had the line F in Fig. 2 of Maynard vertical instead of at an angle as shown in the Maynard drawing; and the Maxwell piston, I think, had the line F pretty much as shown in Fig. 2 of the Maynard drawing.

Q. And the Oakland was the smaller diameter of

the two? A. Yes.

Q. The Maxwell came out first A. Yes; before

the Oakland, as I recall it.

Q. Now, when the Oakland piston was designed, that is, put on the drawing-board, it was naturally necessary to change the dimensions all around? A. Yes.

Q. Even thickness of materials? A. Yes.

Q. And the piston was carefully tested by Oakland, was it not? A. Yes.

Q. The tests running over a considerable period? A.

I don't know how long.

Q. But you rather believe that the piston was run over a considerable period! A. Yes.

Q. Now, what was the purpose of that test? A. To

prove in the piston.

Q. Well, to prove whether or not the parts were dimensioned properly; isn't that right? A. Well, only in part. It was to prove whether the piston met all of

the requirements demanded of a piston.

Q. But partly it was, at least for the Oakland engineers, to determine whether the design, that is, dimensioning of the parts, was correct in order to stand, have the piston stand up in the engine? A. Yes; not only to stand up, but to function without slapping or without sticking and without undue oil pumping.

Q. And that was an experimental test also, wasn't

it? A. Oh, I think so, yes.

Q. What I am driving at, many experimental tests are carried out on pistons of the same construction but of different sizes? A. Yes, that is true.

Q. And one of those tests is to determine whether sufficient or too much clearance has been given to the

pistont A. Yes.

Q. In other words, the clearance is not the same for all diameters? A. No, it is not.

Q. It doesn't even vary in the same proportion,

does it? A. Not directly, no.

Q. Then the dimensioning of any piston requires its dimensioning and construction to be followed up by tests? A. Practically so, yes; it has been so in the piston art.

Q. And that included both block tests, that is where the engine is stationary, and road tests? A. That is correct.

Q. As a matter of fact, some of these road tests on engines containing a new piston, are performed for other purposes than to simply test out the piston! A. Some times a number of things will be under test at the same time.

Q. The road test is really to find out whether the

ear as a whole runs good! A. Some times.

Q. Well, after a trip, what do you do? A. The testing pretty generally in pistons may be divided into two main parts. I should say: the supplier of the piston may make up his mind that a piston of such and such design will be satisfactory. He may be thoroughly satisfied with it, but the motor car manufacturer is never satisfied with any test that the supplier may make; he makes his own tests and satisfies himself that the part is satisfactory. So in that sense, the road test made by the motor car manufacturer is usually made to prove in these various things to satisfy the motor manufacturer that the part is satisfactory for the standard equipment in his car.

Q. And after a long road test, the car is brought back into the shop and various parts of it carefully exam-

ined! A. That is correct.

Q. And even if there is a new piston put in the ear, that examination is not limited to the examination of the piston? A. No, not as a rule.

Q. Do you know how pistons for stationary engines

are tested! A. Well, yes.

Q. They are given a stationary test? A. Yes, they are.

Q. They don't take that stationary engine and mount it on a truck and run it all over the country, do

they! A. No.

- Q. You continually referred to pistons for pleasure cars. Do you find anything in these patents that specifically restricts the subject-matter to pistons for pleasure cars? A. No.
 - Q. The patents are for pistons, aren't they? A. Yes. Q. And they might be for pistons for tractors? A.

Yes, sir.

Q. Por trucks! A. Yes.

Q. For stationary engines! A. Yes.

Q. Even for air compressors? A. Yes, they might be, but some of those are pistons for internal combustion engines; of course those couldn't be usable in air com-

pressors.

Q. Well, they can be used in air compressors, can't they? A. They might be; I don't know; but the problem that is met in the air compressor is different than the one that is met in the internal combustion engine.

Q. Well, assuming that to be true, what we have before the court here is a piston, haven't we! A. Yes,

pretty generally.

Q. Now, going back to 1914 when the test of the Gulick aluminum piston was said to have been made, at that time permanent mold castings had not come into use?

A. Permonent mold castings for pistons?

Q. Permanent mold casting of aluminum pistons?

A. No.

Q. And any aluminum pistons in use at that time were sand cast pistons, were they not? A. Supposed to be.

Q. Well, you are pretty sure that they were sand

cast pistons? A. Yes. I am.

Q. Now, a man might be satisfied with something less exacting in a sand cast aluminum piston than in a permanent mold aluminum piston; isn't that right! A. He probably would have to be if he were satisfied at all.

Q. In other words, a piston that showed up well after say a certain number of thousand miles, alumium piston in 1914, might be considered satisfactory, while in 1920 it might not be considered satisfactory? A. That is possible.

Q. You would expect more of an aluminum piston

after 1915, wouldn't you! A. Yes.

Q. That is after permanent mold practice came into use? A. Yes.

Q. You heard Mr. Guliek testify, didn't you! A.

The latter part of his testimony, yes.

Q. Well, in your opinion a sand east piston that stood up for 4500 miles was a very good piston, was it not? A. Well, I think that depends a good deal on the conditions of testing, the conditions of running. If the piston had little or nothing wrong with it after that test, I should say it was doing very well.

Q. You don't think that piston was too brittle, do you, being sand east? A. I don't know anything about

it.

Q. Well, from your experience in permanent mold casting, would you expect a said east piston, a split sand east piston of the structure described in this Gulick, as

Exhibit 51, to stand up for 4500 miles? A. Well, it depends entirely on the casting, the construction, the clearance allowed, and how well the piston was lubricated during operation, how hard it was run—there are a lot of

factors that have to be taken into consideration.

Q. Well, you were familiar with all the factors, that he ram as much as 60 miles per hour; that he had a clearance so small that he actually pushed the pistons into the cylinders, in your opinion did that piston stand up for 4500 miles, being a sand cast piston? A. Well, I know nothing about it.

Q. Well, I know, but as an engineer what is your

opinion?

Mr. Richey: I don't think his opinion is any good. We have had fast testimony on it, and he is asking his opinion to a fast. I object to it as incompetent.

The Master: This is in cross examination. I

think he may answer.

A. I think that if the piston had been well made and well designed and well fitted, that those are the results

that should have been expected.

Q. In the Kant Skore, in the Sterling and in the United cases, you testified that it was practically essential to employ permanent mold castings where you had a split piston on account of the vibration of the walls of a split piston as it went up and down in the cylinder. You testified to that effect, didn't you? A. Yes. I didn't have 4500 miles or 5,000 miles life in mind, however; I had 30,000, 50,000 miles life in mind. Nor did I have merely six pistons in mind. These pistons are used by the millions, and the desire is that each one shall stand up.

Q. It is your present opinion, then that the sand cast piston constructed like Exhibit 51 and split like Exhibit 51 and split like Exhibit 51 and separated from the head like Exhibit 51, actually functioned in that engine? A. Well, now, you are asking me for a conclusion as to facts, which of course I am not in position to give. If you ask me a conclusion as to whether that could do so.

I will say yes, it could.

Q. But you didn't hesitate at all to give your conclusion as to Monckmeier's piston, did you? A. No, I didn't. I have the Monckmeier piston before me.

Q. Well, Mr. Gulick described his piston pretty accurately, didn't he? A. Yes. I testified nothing as to

facts, however, as regards the Monckmeier piston, that is, as to what Monckmeier did or what he did not do. I had

no way of knowing those things.

Q. But you guess pretty well of what he didn't do?

A. Yes, I analyzed, from the structures before us, as to what he must have done or what he must not have done in certain respects.

Q. But do you want to say whether in your opinion the Gulick piston probably worked for 4500 miles in

1914? A. Yes, I do.

Q. You say you really think it did? A. Well, I can't say as to whether I think it did or not because I think that is asking for a question of fact over which I have no way of knowing. I will say, however, that in my opinion Mr. Gulick's description of the piston and his results are entirely in accord with what might have

been expected.

Q. And you don't think that piston was too soft, then, to operate satisfactorily? A. I think it very likely may have been too soft to operate satisfactorily, especially as regards battering out of the ring grooves, which is usually the first thing to happen to a sand east aluminum alloy piston, and even that does not usually come inside of 5,000 miles. I have run sand east aluminum alloy pistons myself more than 10,000 miles.

Q. You didn't tell the Court in those other cases that, did you! A. No. I didn't. I would have, however, if I had been asked. I told the Court about the buttering out of these rings in the sand cast piston, and of course that is a fact they do, and if the Gulick 1914 piston had been run long enough that difficulty probably would have

shown up.

Q. But that was a matter of metal, wasn't it? A. That was a matter of metal to a large extent, yes.

Q. In other words, 5,000 miles, which is 500 more than Gulick figured out he ran, and those defects would have shown up? A. No, not necessarily, but there was no evidence as to whether the ring grooves had bettered out or whether they hadn't, as I understand the evidence on the Gulick 1914 piston.

Q. Well, you think Gulick would have said that the ring grooves had battered out, if they had actually battered out, wouldn't you? A. He might not even have

noticed it.

Q. 'Even after careful examination? A. Yes, that is true.

Q. You don't think the piston was too brittle? A.

I don't know anything about it.

Q. Well, being a sand east piston and being before the age of permanent molding, which according to your previous testimony in the other case, put the aluminum piston on the map, what have you to say!

Mr. Richey: I object to that, interpreting the witness' testimony without confronting him with it. Mr. Brunings: He is at liberty to say whether

he testified like that

The Master: He may answer. If he wants to get what he said before, let him get it and see, but I think it is proper cross examination.

A. (After question is read) It may well have been too brittle for long life, or if not too brittle it may have been too soft for long life.

Q. Being a sand east piston, it would naturally show up some scoring on account of inclusion of sand? A. Oh, no.

Q. You don't think so! A. No.

Q. That didn't happen in the sand cast piston? A. No, the sand that sticks to the surfaces is all machined away.

Q. It is not in the cavities, in any possible cavities in the aluminum piston! A. No, anything of that sort

would show up on the machining of the piston.

Q. You have stated on direct examination you have read Mr. Gulick's testimony, particularly about the tests that he made? A. No, I didn't say that I read his testimony, as I recall it. I heard him describe his tests. I

read none of Mr. Gulick's testimony.

Q. You heard all of his testimony as to the tests that he made? A. Well, I don't know whether that was all of his testimony regarding the tests or not. I heard him give testimony regarding his tests. To be more exact, I did not hear any of Mr. Gulick's testimony prior to the 14th of March, and I think I heard all of his testimony from the 14th of March until its conclusion.

Q. Now, going to the Schoengarth piston, that piston really had a T-alot in the skirt! A. Not in the ordi-

nary sense that we speak of a T-siot.

Q. How much inclination do you have to give the vertical stroke in order not to be a T-alot? A. I don't know as I could state what inclination the vertical slot should be given, but the lower end of the T in Schoengarth is directly below the center of the coac, and the

location of a slot in that position is such as to make the thrust face at the bottom of the skirt very flexible, that is, the whole of the thrust becomes available to close the slot; whereas if the lower end of the slot is in one of the thrust faces instead of at right angles to the center of the two thrust faces, the explosion force, or the other thrust force, is not so potent in causing collapse or closing of

the slot itself.

Q. You see a wide distinction between the T-slot of the Schoengarth patent and Exhibit 48, leaving out of consideration for a minute the adjustments of the Schoengarth patent? A. I don't know whether to call it a "wide" or not, but there is a very marked difference. In the Exhibit 48 the vertical slot begins not in the center of the thrust face at the top of the skirt but off to one side from the center of the thrust face, and then goes diagonally toward the bottom of the skirt are distance from a line drawn between the center of the boss vertically to the bottom of the skirt. The Exhibit 48 slot therefore has a tendency to utilize only a portion of the thrust force to close the slot, whereas the slot of Schoengarth can utilize the entire thrust force to close the slot.

Q. You think Exhibit I is more like Exhibit 48, or more like the Schoengarth patent, disregarding for a moment the adjustment, considering only the slotting? A. In one sense it is more like Exhibit 1, because the center of the vertical slot in Exhibit 48 is in the center of the thrust face, and the center of the vertical slot in Exhibit 1 is in the center of the thrust face; whereas in Schoengarth the center of the vertical slot is way over to one side of the center of the thrust face. On the other hand, the angularity of Exhibit 48 slot is more like the Schoen-

garth slot than it is the Exhibit 1 slot.

Q. But Schoengarth's vertically extending slot starts from about the center of the horizontal slot, as in Exhibit 1, while in Exhibit 48 it starts, the vertical slot, starts from neaver one and of the herisontal slot?

A. That is correct.

Q. In that respect Exhibit 1 is more like the Schoengarth patent? A. With respect to the top of the vertical slot, that is true.

Q. Well, leaving out the adjustments of the Schoengarth patent, the skirt will contract and expand, will it not? A. The bottom of the skirt will, if the sections of the metal of the piston are made proper, but the top of the skirt, that is the portion of the guide section above the horizontal alot, will not.

Q. You mean the part above the slot 3 in Fig. 21

A. That is correct.

O. That of course will not expand? A. That is not flexible, no.

Q. That is not flexible. And that part in Exhibit

48 is also not flexible, is it? A. No, it is not.

Q. According to Mr. Gulick it is just made smaller in diameter? A. Yes, or according to Mr. Gulick that horizontal slot in Exhibit 48 or in, rather, pistons of which 48 would be considered to be a rough example. the horizontal alot divided the head section from the guide section.

Q. You don't actually find that in Exhibit 48, do

you? A. I haven't measured it.

Q. Well, you can measure it right now and settle it.

A. (After witness measures same.) No.

Q. What did you find the diameter of the part above the slot, the horizontal slot, along the line of the wrist pin bosses, to be! A. 4.121" approximately.

Q. And the same diameter at right angles to it? A.

Yes, approximately.

Q. What is the diameter of the top ring land? A.

4.118", approximately.

Q. In other words, that piston don't represent accurately what Mr. Gulick said the 1914 piston construction was! A. 19141

Q. 1911. A. No, it does not.

Q. That happens in patent drawings, too, doesn't it. that putent drawings don't abow the actual dimensions?

A. Very often they do not.

Q. Well, most of the time they don't? A. Oh, most

of the time they do not show actual dimensions, no.

Q. And even when an ellipse or an oval is supposed to be shown on the drawing, having a very slight difference between the major and minor axis, the draftsman usually takes a compass and draws a circle, doesn't he! A. I think he is apt to, yes.

Q. Now, going back to a comparison of the Schoengarth patent and Exhibit 48, the bottom of the skirt is very, very flexible, is it not, of Exhibit 481 A. Yes, it is.

Q. And that is one of the faults you found with the Schoengarth patent construction, leaving out the adjustments? A. Oh, I don't find that particularly as a fault with the Schoengarth patent, leaving out the locking rings, I merely call attention to it as having no useful function.

Q. But you do find that a fault with the Kant Skore piston, Exhibit 3-Z, didn't you! A. Yes, that is

a fault in the Spillman type piston.

O. Do you know why Mr. Schoongarth in his patent carried the slot 4 around so far, that is, can you tell from the patent itself, or do you remember whether the patent

states why he did! A. I don't remember.

Q. Well, I want to read to you a sentence from the patent, page 1, lines 53, et seg .: "This slot is cut diagonally for two purposes, first, to prevent scarring, and, second, for convenience in making the upper and lower piston adjustments." The first purpose of preventing a scar, that is common with practically every piston, to incline the slot, for instance as in Exhibit 17 A. That Q. In other words, if you have it vertical, why, poo-

ple believe that there will be a groove worn in the cyl-

of the slot slightly diagonal.

Q. Now, the second reason, for convenience in making the upper and lower pister adjustments, can you tell me what would have happened if Mr. Schoengarth had located his adjustments gight down below the middle of the horizontal slot, that is, in one of the thrust faces? A. Yes, I think so. I think the adjusting means would have interfered with the connecting rod in the stroke.

Q. But of course if he shifted it around, the lower adjustment particularly, if he shifted it around, it would

not interfere with the connecting rod! A. That is cor-

rect.

Q. At the top he could leave it in the center, couldn't

he? A. Yes.

Q. Mr. Schoengarth used somewhat inwardly projecting adjusting parts which required him to shift the lower adjustments around at right angles from where he could have put it if the connecting rod had not been there? A. That is true. The location even at the top of the skirt is placed in the thrust face so that the locking and adjusting means will not interfere with the bosses. So that everything in the Schoengarth construc-tion is designed to be used with those locking means.

Q. Well, he uses those locking means and he inclines his vertically extending slot to the limit in order to locate his lower adjustment? A. That is correct, and

also the upper adjustment.

Q. Well, so far as the upper adjustment is concerned, the vertical slot can start from the middle of the horisontal slot! A. Yes, or it could start from the bosses; it could start from any place. The location of it in the thrust face is merely incidental, as I see it, to the freedom from interference with the bosses themselves.

Q. Well, the required freedom of interference with the connecting rod required the slot to be on that long slant? A. Yes, that is the only reason that the vertical slot is placed as it is, and consequently the horizontal

slot is placed as it is as I see it.

Q. You have said that the piston was more rigid than a non-slotted piston. Did you mean by that that the structure itself with the slot in it and with the two screws in it, would be more rigid than if there would be no slotting of the piston at all? A. I think so, yes, more rigid against distorting to an out-of-round shape, for example, to accommodate itself to a cylinder that might be slightly oval.

Q. Well that is what the adjustment was for, wasn't it, to adjust it to a cylinder that was oval? A. No. I think the adjustment was to merely take up the exten-

Q. Where did the want take place in an engine cylinder all around? A. Well, yes, it takes place to some extent, but by far the greater part of it is usually on the thrust faces.

Q. And that adjustment would take up for that

wearf A. I don't know I suppose it would.

Q. The piston itself, without the slotting or without the adjustment as shown in the Schoongarth patent, is the Ford piston of that day, isn't it! A. I don't know.

Q. You are not familiar with it! A. No.

Q. One of your objections to the Schoengarth pat-ent was that there was no relief in the region of the wrist pin boss. That is a serious objection in your opinion, is it? A. Well, I mentioned that as one of the features of the construction as shown. There is not any relief shown around the bosses, and, particularly, no relief to work in combination with the slotting, as in the patents in smit

Q. Now, Doctor, you have read a good many piston

patents! A. Yes.

Q. You would be almost safe in saying you have read almost all the piston patents, haven't you, that is seed in this country? A. No, no, not nearly all. I understand there are ever 2,000 of them, and I don't sup-

pose I have read more than 75 or 100.

Q. Do you remember whether each one of the piston patents that you have read has specifically stated that the piston should be relieved in the region of the wrist pin bosses? A. Well, if the relief is to function in combination with something sine in the piston of an unusual nature, it certainly should be mentioned and described.

Q. Will you please answer my question after you

have given your reasons for why it should be? A. I think your question is so general that it is practically im-

Q. Will the reporter please read the question to the witness? A. (After reporter reads question to witness) -I am ours that each one has not.

Q. It is universal also to reduce the diameter of the

piston where the ring lands are? A. Yes, it is.
Q. That has been the practice as long as you can remember, isn't that right? A. Not necessarily the whole of the ring lands but the head of the piston in some place is separated from the skirt by head clearance, and that has been the practice as long as I know anything about it. Of course that does not follow that that extra elegrance is necessarily given around each one of the rings.

Q. But it has been the practice for as long as you remember to make the head of smaller diameter than the

skirt! A. Yes.

Q. And in the patents that you have read that proposition has not been repeated each time, has it?

A. No. I think not always.

Q. Well if it was repeated it shows the patent solicitor didn't know the state of the art? A. No, it wouldn't indicate that at all. In some of these constructions it becomes quite important just where this head relief and where the guide section begins, and I think it is important to note that in places where that separation has more than the ordinary significance.

Q. Well, it is so important that no piston has been made for the last 20 years in which the head wasn't larger than the skirt? A. You mean the head smaller

than the skirt?

Q. The head smaller than the skirt! A. Not that I

know of.

Q. Now, you wouldn't expect a patent to repeat university well known feature of a piston, would you't A. If it is important I would.

Q. But otherwise not? A. If it has no bearing on

the patent, I don't see any reason for repeating it.

Q. Well, if you read a description of a piston and nothing was said about the head being smaller than the skirt, wouldn't you read it right into that patent? A. Oh, I think I would, if it is an ordinary piston.

Q. What would happen in a piston like the Schoengarth patent if the diameter of the part above the slot 3 was of larger diameter than the cylinder? A. Was of

larger diameter than the cylinder!

Q. Yes. A. Well, if it were larger than the cylin-

der you couldn't get the piston in.

Q. And what would you do if you had such a piston? A. Oh, I would fix it so I could get the piston in the cylinder, certainly.

Q. And you would turn it down, wouldn't you? A. I would know that the fit was wrong and I would try

to fit it properly.

Q. And you would allow elegrance at that point, wouldn't you? A. Yes, I would allow elegrance but how much elegrance I don't know at the moment.

O. Well, you would be safe in allowing head clear-

ance, wouldn't you? A. Yes.

Q. And that is the only thing to do in a construction are Schoengarth, is to apply the head clearance to the lower ring land, that is the part below the lowest ring groove? A. No, that is not the ring land, that is

part of the skirt in Schoengarth.

Q. All right, now, I say the part below the lowest ring groove? A. No, that is not the only thing to do, at least it wasn't back in 1915 and '16 at the time of Schoengarth. The natural thing to do was to make the whole skirt section the same diameter unless otherwise stated, and the division between the head and the skirt of that piston would certainly not be lower than the bottem ring groove; it might be higher but it certainly would not be lower.

Q. You would think, then, that any engineer that read the Schoengarth patent would deliberately fail to leave clearance sufficient to prevent seizing of the part below the lowest ring groove and above the slot 31 A. No, he would provide clearance of the whole skirt sufficient to prevent seizing, including the slotted portion

and the portion above the slot.

Q. Even if he wanted to expand it! A. Hewouldn't expand it until he got enough wear to take up. In fitting that piston, as I see it, it would be fitted

just like a trunk type piston at the outset. Then, later, after the skirt had been worn, this adjustment would be applied and the whole of that skirt would start out with

the same clearance.

Q. And when you got through adjusting that piston you would have a piston structure in which the skirt is of larger diameter than the part above the slot 3, isn't that right? A. Not necessarily. It wouldn't do any good-to be of larger diameter.

Q. Even if you would expand it? A. Well, if the piston were fitted right in the first place, you would have just as much wear on the portion below the slot as you would above the slot, or approximately the same amount.

Q. But please answer this question now: assuming that piston to be of uniform diameter from the bottom of the skirt to the lowest ring groove, and you would then expand that skirt, you would then have the skirt at right angles to the wrist pin bosses of larger diameter than the part above the slot 31 A. Yes, if you expand it with the expanders, then it becomes larger in that other part.

Q. Or if you spring it, that would happen! A. If

it is sprung outward, yes.

Q. And you can spring cast iron for a few thousandthe of an inch. can't you! A. Oh, you can't spring it there without the help of the slots; you couldn't spring the part just below the part 3 without also springing the part just above part 3.

Q. If you had the slots in it you couldn't spring the skirt out? A. No, I say without the slots you couldn't

do that.

Q. With the slots? A. With the slots, the part below 3 could be sprung out a little farther than the part above 3; but there would be no flexible skirt structure

under those conditions, the skirt would be rigid.

Q. Doctor, it was the general practice when you started to go into this piston business, learned the piston business, to have the diameter of the skirt below the lowest ring groove smaller than the skirt itself, wasn't it! A. No.

Q. I am referring to the Howe patent. I call your attention to Howe patent 908,569. You know, don't you, that automobile manufacturers paid royalties on that

patent? A. No. I know nothing about it.

Q. You don't know anything then about the practice then of using that Howe construction in pistons way back as early as 1915 or '16 or '171 A. No.

Q. You weren't familiar with that! A. No.

Q. That is the feature that is shown in the Maynard patent, isn't it, in Fig. 2 at J, reducing the diameter of the head in that case? A. Yes, that is somewhat similar, at any rate.

Q. Well, anyone reading the Schoengarth patent as early as 1917, he would naturally read into it that that piston had to be relieved in the region of the wrist pin

bosses? A. No. I think not.

Q. You mean to say it was the general practice then in 15, 16 or 17 not to relieve pistons in the region of the wrist pin bosses? A. No, I wouldn't say that, either.

Q. You don't know, do you! A. Yes; sometimes

they were relieved and sometimes they weren't.

Q. What happened if they were relieved? At They

needed a little more clearance in fitting.

Q. As an alternative of clearance, relief was provided in the region of the wrist pin bosses? A. Yes, if reliefs were present that made it possible to use a little less clearance.

Q. Then you have the alternative of naing a relief. for instance as in the Kant Skore piston 3-7, or of using an oval piston with the smallest or minor axis on the line of the wrist pin bosses! A. Well, I don't know what one might have done with that Schomgarth piston at that time.

Q. I am talking about pistors generally, I am not limiting myself to the Schoengarth. I am just using those two types of relieving the oval structure with the smaller or minor axis along the line of the wrist pin bosses, or an actual out in or cast in relief! A. Well, one might use meither.

d. Those were two expedients that were interchangeably used as early as 1917? A. In solid type pietons, I should say, yes.

Q. And anyone reading the Schoengarth patent in 1917, one skilled in the art, in this particular piston art, would know of the use of those two or three alternative

constructions of securing relieft A. He might, yes.

Q. Why do you say he might, if he was one skilled in the art? A. Well, for all one could tell from the Schoengarth patent, this adjustment might do all the things that would be necessary for the proper operation of the piston.

Q. Well, if you found out that it didn't, would he naturally put in a relief? A. Oh, naturally a person

would try to get the best result he could.

rome reading mis-

Q. You know, don't you, that anyone reading piston patents in 1916 or '17, and starting to design a piston, he would naturally put on reliefs in the region of the wrist pin bosses? A. No, I don't say that he would naturally do that.

Q. Well, unless he used a construction such as the Gulick patent structure or the Spillman & Mocers? A. Why, no, people used trunk type pistons without relief

around the bosses.

Q. Were they skilled engineers? A. Yes.

Q. Well, do you consider that proper practice? A. I thought it was supposed to be pretty fair. Packard used it in their 12 cylinder cans. They used the trunk type shuminum piston without relief around the houses.

Q. And how long did the Packard 12-cylinder motor stay on the market? A. Oh, about three or four

years, maybe longer.

Q. You have talked with the man that owned one, haven't you? A. Yes. I have ridden in them. I have ridden around the Indianapolis Speedway with Col. Vincent in one.

(Thereupon, adjournment was taken to the following day.)

(At 9:20 a. m., Tuesday, March 21, 1933, the

Q. Dr. Jeffries, one of the distinctions that you stressed of the Mooers patent in suit over the Bohosn-garth patent is that the Bohosngarth patent does not describe any relief in the region of the wrist pin bosses.

A. That is one of the things, yes. The other is that Schoengarth does not have the horizontal separation between the head section and the guide section.

Q. Well, you don't think it makes any distinction that that Schoengarth alot only extends around a little less than 180° rather than almost all the way around, as in Moores! A. Why, the principle would work in that way, if relief were combined with such a slot, provided

the slot were properly located.

Q. Properly located. What you mean is that the part of the piston above the slot should be reduced in diameter to, oh, approximately what the head diameter on the ring land was? A. Yes, or at least have sufficient relief.

Q. Of course, when you talk about the Gulick 1911 piston and when you make your distinctions over Schoengarth and various other patents, you assume that that

piston, that 1911 piston like Exhibit 48, actually had the part above the slot reduced in diameter? A. Yes I assume that, and I also assume that the skirt was made to flex in the motor, not merely be there to enable some one to lock the skirt into some definite position, like Schoengarth.

Q. Do you make that definite assumption because you heard or read of Gulick testifying to the effect that the 1911 piston like Exhibit 48 had the diameter reduced above the horisontal slot? A. That is correct.

Q. And if that weren't true, would your opinion be the same? A. No, if that weren't true I would say that the Gulick 1911 piston did not embody these inventions

Q. In other words, in order for the Gulick 1911 piston to embody any of the patents in suit, it is essential that the diameter of the part above the horizontal slot approach the diameter of the ring lands which are usually of the standard clearance? A. Not necessarily that far, but the diameter should be less above the hori-

sontal slet than it is below the horizontal slot.

Q. How much, roughly, would you say it would have to be on a 4" piston? A. Well, on a cast iron piston it probably wouldn't have to be more than a couple of thousandths of an inch less to make the slotting operable; but on an aluminum piston it should be more. I would say, functionally, that the diameter of the portion above the slot should be reduced enough so that it would not seize when the piston operated in the motor. Then it could be reduced considerably more than that without hurting the operation, and it might even help the operation some; but that is the distinction.

Q. What would you say for a 4" piston like Exhibit 48 with a clearance only as little as two thousandths of an inch—I don't mean per inch diameter new, but for that particular piston? I just want to get a general idea. A. Oh, in a cast iron piston, if that difference in diameter.

eter were two or three thousandths of an inch, that would be some help, yes, it might be sufficient.

Q. But five or six thousandths would not hurt! A

Oh. that wouldn't hurt, no.

Q. Now, in distinguishing between the Galick 1911 piston and the Schoengarth, patent piston, you stated that although the 1911 piston like Exhibit 48 had no relief in the region of the wrist pin bosses, it would work all right, to a degree, with cast iron? A. Yes, that is my opinion.

Q. That, of course, assumed that the diameter of the part above the horizontal slot provided for clearance?

A. Yes.

Q. What have you to say about aluminum as to such a piston! I notice you said it would work, to a degree, with the cast iron. A. Yes, it would not pro-

vide so much help in the aluminum piston.

Q. In other words, in the aluminum piston it is necessary to relieve the outside of the skirt in the region of the wrist pin bosses? A. Either that or put the slot around the other side and make the metal connection between the head and the skirt very much less than it would be in the Gulick 1911 piston with the horizontal slot on one side only.

Q. You mean it is necessary to put a horizontal slot on each side, like in the 1914 piston? A. Yes, to get much help, to get enough help to make an aluminum pis-

ton function materially better.

Q. Do you think it made any difference whether the slots went all the way around in the 1914 piston or only stopped in the region of the wrist pin bosses! A. Yes, the slot going all the way around made a less rigid construction between the head and the skirt portion, and would make possible some distortion of the skirt in response to the cylinder wall pressure.

Q. Do you think it would have worked all right if the horizontal slot hadn't gone all the way around? A.

Not so well.

Q. But you think it would work all right? A. It

would have functioned to an extent, yes.

Q. The reason I am asking that is that one of the witnesses who was examined on behalf of Gulick said that in that 1914 piston the slot did not extend all the way around, but was more like Exhibit CCC in that respect. It is your opinion that the Gulick piston, even if the slot only extended part way around, worked all right? A. Well, I wouldn't say it worked all right; but it is my opinion that it would function to an extent. It would not be as good as the one in which the slot extended all the way around.

Q. Would an ordinary skilled mechanic make the diameter of the ring lands, the parts between the grooves, so near the diameter of the cylinder as to leave only, say, two-thousandths clearange? A. Between the ring

grooves and the cylinder!

Q. Between the ring lands and the cylinder! A.

No. I shouldn't think so.

Q. In other words, from as long as you have been connected with pistons, the operation of pistons, it has been the practice to give considerable clearance to the head part of the cylinder containing the ring lands! A. Yes, it has.

Q. And it has also been the practice to taper the skirt from the bottom of the land ring groove to the end?

A. That is an unusual practice.

Q. Was it an unusual practice! A. Yes.

Q. But it was practiced! A. It was done, yes,

Q. And that made the skirt at the top smaller in diameter than the skirt at the bottom! A. Yes.

Q. There was a usual and standard taper in pistons, wasn't there? A. Nothing standard, I think about it. o infranctions are recommended and the comment of

Q. But the idea was to take care of the difference in expansion as between the skirt at the bottom and as between the skirt at the top? AA. That is right.

Q. In discussing the Guliek 1914 piston, Exhibit 51, I see you state that the construction was such as to per-

mit distortion. Can you explain that! AA. Yes.

Q Is it possible for you do use Exhibit 51 to describe that! A. I showed yesterday in connection with Exhibits 72A and 72B what a tremendous restraining offeet the connection between the piston head portion and the guide portion made in the rigidity or desibility of the skirt portion. The connection, for example, on a piston like Exhibit 1 makes even the bottom of the skirt, some two inches away from the connection, fifteen times as stiff as when the connection is severed. In the ordinary trunk type platen with the connection of the head and skirt around the sutire periphery of the skirt, the rigid head section resists the deformation of the skirt section, especially mean the junction between the head and the skirt sections. In the Guliek 1914 piston, Exhibit 51, the head section is separated from the guide section by two horisontal slots which make the separation of the head and the skirt, say 75 or 80 per cent complete. This relieves the contraining effect of the rigid head from its effect on the distortion of the skirt. The vertical alot in Exhibit 51 permits the skirt to distort where it can, the play being taken up in the alot. Where there is no glot or no relief there is no place for play to be taken up. 80 that the piaton would fit tightly against the cylinder at every point of the circumference. Where there is relief alone there may be some place for the relieved part to move so that such a piston may be dis-

torted somewhat in the cylinder. The slot, in effect, takes the place of the relief inasmuch as it provides room for the other parts of the cylinder to move when the distortion forces are applied. Therefore in my opinion the 51 construction provides for some distortion of the skirt at the top of the skirt.

Q. You believe a piston like that without relief in the region of the wrist pin bosses operated successfully with a snug fit! A. Well, "a snug fit" is a relative

term.

Q: Oh, I understand that. It means a fit that you simply push it in rather easily! A. Well, it means one thing to one person and another thing to another person. The difference between the proper fit and the improper fit may be unmeasurable with any instrument.

Q. A snug fit isn't one you simply drop a piston in a cylinder and let it run way to the bottom! A. Well, I never saw any piston that would fit that way. I never saw a piston but what looked like a snug fit to me.

Q. And that was several thousandths clearance! A. policy following for the Alago

Yes, yes.

Q. Now, you understand of course that Exhibit 51, as Mr. Guliek said he used it in 1914, did not have the relief in the region of the wrist pin bosses! A. Yes, I understand that

Q. And I suppose that is the distinction over the Mooers patent? A. That is correct. The Mooers principle could not work in the Guliel 1914 construction. The Mooers distortion comes from forces within the piston itself, not as a result of cylinder wall pressure.

Q. And Mooers provided relief in the region of the connection, and Mr. Guliak provided the slot; is that the

differencet A. No.

Q. Between 51 and the Mooers patent! A. No. I just explained it. The Mocers provides a combination of horizontal clotting between the head section and the guide section, and relief at the connection between the head section and the guide section; so that the distorstruction and the differences in temperature. Any dis-tortion in the Gulick 1914 phoen, Exhibit 51, would have to occur as a result of splinder wall pressure against the piston, that is, external to the piston.

Q. The Guliek piston, Enhibit 51, would work better if it had relief in the region of the wrist pin bosses!

A. No doubt about it

Q. No doubt about it at all! A. No.

Q. And that relief, the prior art shows, was the quite usual practice at that time? A. Not in combination with flexibility and not properly positioned to cause that benefit.

. Q. Now, coming to the Monchmeier cast iron piston. Exhibit 3.V. that piston had plenty of wear in it?

A. Yes, it had.

Q. In fact, taking the digneter just below the slot, the diameter along the line of the wrist pin bosses, is about seven thousandths greater than at right angles; isn't that right, from your figures? A. Yes

Q. Well, that was due to wear, wasn't it! A. I

think so, yes.

Q. You don't think for one minute it was turned

oval like that? A. No.

Q. In fact, if it was turned on a lathe or grinder it must have been turned around; isn't that right? A. Yes, ordinarily.

Q. If that piston had twenty-thousandths clearance. then the wear on the diameter of the wrist pin axis was

about two thousandthat A. Yes.

Q. Very little wear on the wrist pin axis? A. That is true.

Q. Now, you would expect wear in a racing car such as Mr. Monckmeier described, wouldn't you! A. Yes.

Q. You would expect lots of it, wouldn't you! A. I should think so.

Q. The purpose of those racers is to win the race even if they do damage their car some? A. Yes.
Q. In fact you find that wear on the head also, don't

you! A. I find the wear on certain of these ring lands.

There is no went on the head.

"Q. Well, I mean the ring lands on the head. They were worn! A. The ring lands, some of them were hadly worn, showing that they had been bearing against the evhinder wall.

Q. Will you again take 3-V and take micrometer measurements across the top ring land at right angles to the axis of the wrist pin bosses! A. (Witness comphes.) 4.457".

Q. Will you correct that on Exhibit 741 A. Yes,

at was a mistake of ten thousandths of an inch.

Q. Just correct it. Cross out the figure on the exhibit and put in the other figure. A. (Witness comphes.)

Q. It is your idea that the slotting never came into play in that piston? A. For any use, yes, for any good

use. Of course, if a piston were run with the slots in, the bottom of the skirt would have flexed, but it would

not have done any good.

Q. But as far as the top of the skirt part below the horizontal clots, there was really no bearing on them at all, was there; that is, as distinct from the part above it, as you see it? A. Not to any appreciable extent at any rate.

Q. But, Doctor, you say later on if that piston had been in uncothis connection should have been broken. How do you explain that? A. Well, I said it may have been broken. I didn't say it would have been broken.

Q. That is what you meant, it might have been

brokenf A. Yes.

Q. But not necessarily would have been broken? A. I wouldn't say it would. I would expect it to have been,

however.

Q. It would be ufficient to have a T-slot on one side, if it did function properly; it wasn't necessary to have the T-slots on both sides function! A. Not if one of them did some good, the other one could be out of commission. But neither of these will do any good.

Q. That is your opinion! A. That is my opinion.

Q. You have never seen any Staver automobile,

Q. You have never seen the Tester engine of that

date, have you! A. No.

Q. You don't know what kind of oiling system they had? A. No.

Q. You don't know the condition of the cylinders of

those motors, do you! A. No.

Q. Do you think it made any difference whether there were alots on both sides or only on one side? A. Yes.

Q. You think it would have functioned better if it functioned at all, if the slots had only been on one side?

A. No, I think it would function poorer with the slots on one side, and still poorer with the slots on both sides.

Q. It was the practice as early as you can remember to give so much elearance per inch diameter to a piston?

A. No, not necessarily. Each car and each condition had to have the elearance varied to sait such car and such condition.

Q. It is your opinion, then, that the required elearance don't increase with the diameter of the piston! A. Yes, it does usually increase with the diameter of the piston but it does not increase accessibly the same amount

per inch of diameter of the pinton.

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Q. Then with a 41/2" piston you would need more clearance than with a 3" piston? A. Yes, if they are

the same kind of a piston.

Q. In this Monckmaier piston circumferential ex-pansion took place in that skirt, didn't it, run under very extreme conditions? A. Well, what do you mean very extreme conditions! A. Weby "circumfeentiel expunsion?!

Q. Well, the skirt expanded circumferentially, say at the bottom, as it became heated up? A. Yes, except that is all referred to in terms of the expansion of the

display to the same to be a second

Q. One of your objections to the Month on pieton is, again, it has no relief in the region of the rist pin beaus? A. Yes, it has no relief, in combina-on with the hesistatal and vertical eletting, the hori-tal also magnitude the head section from the skirt wrist pin to g the by

Charles and a discovery for a little

at A. All around one of Charles on the SIA pale and the

her: The one that is thipped on the

elitacili restato henco of A. In the oil groove, near the but tically all the way around

d up by those grooves, waen't

from the walls of the sylinder! A.

the shirt estaids of the region of the wrist a to any blow by! A. It is quite difficult ton is so many but I think there is evine deposit in many parts of the skirt. For a battom of the skirt, where the workers not been completed, there is a fairly large area

determ of the polyment to dear up

Zay Julides, Cross Bassid

that looks like carbon deposit that has been cleaned off

that looks like carbon deposit that has been eleaned off or at least an attempt has been made to clean it off.

Q. You don't find any earlier deposit in the borizontal slot opposite the one in which the vertical slot has not been completed? A. I find no carbon deposit in any of the slots. In fact, the little oil groove just below the bottom ring has carbon deposit in it in the region of the created broken has and the carbon deposit stope abruptly where the harmontal slot begins.

Q. But in that top groove, the top groove picked up the deposit by rebbing back and forth in the sylinder and constituted it in these? A. Wall, I don't know.

Q. Well, that is a matural thing that hoppess in a piston of that bind?

A. That is manuary, yes.

no way, you

piston of that kind! A. That is manually you Q. And with a spleak system, or any system cation as far as the vertical state are const is oil spleabing in those all the time, as far as the ver-tical and bornsontal slots are contenad, there is oil spleabing in those during all the time of the security amed, there

of the expired A. A. , Double aving bear interface to Well.

at A. Fo, lithink so.

on the thrust faces has been in the of at least 008 of an inc There A. Yes, the .009 of an i

O The skill is off the same it through as four the manner with the A Yes, as mostly as I can measure dismotor all the way dish you have taken? ere it, that is on the boss axis. So much of the skirt is broken away on the other axis that no measurements can be unite at or below the bosses

Q. That is a sand cast pistor, is it not, SW! A. strong show the second Yes

Q. You would expect it to be soft, wealth't you! A. Well-

Q. As compared with the permanent mold east pig-m? A. I would expect so, yes. I cam tell in a memont. ton! A. Iw (Witness hits pictors together.) I have just knocked Exhibit 72-A, which is the head section of a permanent mold casting, against the head section of Exhibit 3-W, and the Exhibit 3-W exhibits a considerable dent, where-

as Exhibit 72 is hardly affected.

Q. As a matter of fact the skirt in that aluminum piston has a taper of 001 of an inch, hasn't it, from the top to the bottom? A. Well, according to my measurements they were the same, 4.47".

Q. I believe you gave the figure of the top of the skirt below the slot as 4.472 and at the bottom 4.473? A. Well. I took these figures from Mr. Gabriel's shorthand

record yesterday and I can re-measure it.

Q. Re-measure those two. A. (Witness complies.)

I find them both the same, 4.473".

Q. Mr. Monakmeier could not have obtained a dieeast piston or a permanent mold piston in 1915, could be, the early part of 19151 A. Well, I imagine he could after the very late winter of 1915.

Q. But not in the forepart of 1915? A. No. I think

not.

Q. And that said east aluminum piston was about the best he could get, I don't mean as far as comparison of two said east pistons was concerned, but he couldn't have gotten anything else better in the aluminum piston in the early part of 1915? A. It would have been fairly soft, if he had the required toughness in it, yes.

Q. Has there been distortion in that piston due to heat, assuming it has been through a first A. I don't

know.

Q. Well, you could tell from your measurements whether there is much distortion, couldn't you? A. It doesn't appear to be distorted, at least across the boss axis.

Q. Have you measured the temperatures of any pis-

tons of any racing cars at the skirt? A. No.

Q. Do you know whether as a matter of fact they never do reach the temperature of 450 Fahrenheit? A. Oh, I should think they did. The figure I used in connection with this aluminum pinton was 450 degrees above the temperature of the cylinder wall. And then I only took .025 of an inch as the clearance, and the indication here is that it would be at least .027 of an inch, and that would be on the presumption that the piston operated in the cylinder of just 41/4" in dismeter; so if the cylinders had been rebored the cylinders would have been larger than that. But I did say that this Defendants' Exhibit 3-W had a larger clearance than was used in the 5" trunk type Liberty Motor sixplane engine.

Q. You assume it had .028 clearance! A. No. I as-

sume it had .025 clearance. Q. What made you take that figure? A. Why, I made a rough measurement on it before my cross examination, just to get a rough idea of the diameter, and I took 025 clearance just to be on the safe side. Even with a 025 clearance, I think the calculation gives about 470 degrees Fahrenheit above the temperature of the cylinder.

Q. Now, Mr. Quan, you say he was familiar with these piston problems? A. Yes, he was

Q. Did you consider his opinion good in 19201 A.

Yes. Q. He didn't deliberately make a mistake, did hot A. Well, I don't think he did.

Q. He was rather careful in making statements.

wasn't he? A. I don't know that he was.

Q. Well, do you think he would have made wild statements without basing them on something! A. No. I wouldn't characterize him as being wild about statements he would make.

Q. Did you read this article on Aluminain Piston Design in Antomotive Industries of January 29, 1920,

which is in evidence! A. Yes.

Q. Do you remember whether you read it at that time! A. No, I don't remember whether I did or not.

Q. Well, you kept pretty close track of piston designs, didn't you, in those days! A. Well, fairly close track.

Q. Now, in referring to Fig. 8, two views on page 363 of that article, you stated that that piston was a the same as Exhibits E and F, with the excep boss relief. The boss relief is not illustrated in that rig. 81 A. Yes, I made that statement, but my attention was called to the special bose construction

Q. Oh, yes, I am not stressing that point. I get your explanation on that, I think the Master did, too, however, you can repeat it if you want to. A. No, there

of shown in the drawings in Fig. 8.

Q. The parts of the figure on the left, that was the cross section, seems to indicate that the wrist pin boss connects directly with the web, doesn't it? A. Appear to be, yes.

Q. Now the Fig. 10 on page 894, at the left, two figures, that is of the Franquist piston, is it not? A. I should say Fig. 9 is of the Franquist piston.

Q. That is what I mean, Fig. 9, yes. What is the Franquist patent, 1,153,902 corresponds generally to that, does it not! A. Wes.

Q. Now, there is no relief shown there, either, is

there, in the region of the wrist pin bases? A. No. illustrated do you find a single case where there is a relief shown in the region of the wrist pin bosses? A. Ves.

Q. Wheref A. Ob. Fig. 5, for example, the hour-

gless piston; Fig. 6, the Ricardo piston.
Q. Oh, yes, those are constructions where it stands out like a sore thumb, Dr. Jeffries, but you don't find relief shown in Fig. 1, Fig. 3, or Figs. 9, 10 or 11, nor in Figs. 7 and 8, do you? A. No, just in Figs. 2, 5 and

in Figs. 7 and 8, do you? A. No, just in Figs. 2, 5 and 6, I believe.

Q. And that is because they were of the hour-glass and slipper type construction, and he couldn't help but show it? A. Not so with Fig. 2, however.

Q. Fig. 2, that shows a distinct relief in the region of the wrist pin boson, does it not? A. Yes, it does.

Q. But there is no question about the Franquist patent disclosing relief in the region of the wrist pin boson? A. No, the Franquist specification estates that there is to be extra absarance in that region.

Q. But Mr. Coun dish there a refer to that? A. No.

Q. In fact, he don't water to relief as to any of these pistons, does he? A. No.

by an engineer at that time, that there were reliefe? A. Oh, I think not

Q. You think not? A. A relief, especially in com-bination with these other things, is consthing which is vital to certain of these constructions; where it is, of

wited to certain of these constructions; where it is, of course it should be mentioned and described.

Q. I am not asking you to repeat that every time, Doctor. I think both myself and the Master understand your theory that there are combinations as distinguished from aggregations, and that the relief auters into every one of these accestractions. You don't have to repeat it unless it is absolutely inscensely. I am asking you this plain question, whether an engineer, in lossing at a piston in 1920 or even at early as 1915, found it messary to repeat every time that you must relieve this piston in the region of the wrist pin boson, or it is desirable to do so! A. Well, that may be your idea, but I get the impression you were asking me to read into most any impression you were asking me to read into most any

prior art piston, one at a time, each of these elements

and combinations in the patents in suit.

Q. I am just simply taking the position, Dr. Jeffries, of the Supreme Court of the United States in Webster Loom Company vs. Hagens.

Mr. Richey: I think the witness is entitled to

explain his answer.

Mr. Bruninga: He is entitled to explain his answers, but let him give his answer and then if hewants to qualify it later on he can do it on re-direct.

Q. You said that this article represented the efforts that were made to solve the problem, and that it did not do so, and did not give the public a solution. Now, this was January 19, 1920. Was Mr. Gunn familiar with what was being done at the Aluminum Company of America by Mr. Jardine! A. J. don't know whether he was or not.

Q. He was with the Packara Company at that time,

wasn't het A. I think so.

Q. And there was rather close friendly connection between the engineers of Packard and the Aluminum Company of America and of the subsidiaries around there? A. Just the usual relationship between the auto-motive engineers of the manufacturing companies and the automotive engineers of the parts companies.

Q. But he does mention the Long juston and the Franquist piston, and he says pistons of the Long and Franquist type are split to allow the piston to sming!

A. Yes.

Q. Now, did be make a mis statement, or is that a correct statement? That occurs on the first page of the article A. He made a statement which is probably correct, qualitatively, at may rate, but his statement was not very accurate with respect to Franquist.

Q. You think it was accurate with respect to Long?

A. Ob, Inthink so.

Q. You were familiar with the Long piston at that time, weren't you, in January, 19201 A. I don't know whether I was or not.

Q. Well, where did you get your information as to the Franklin Company asking the Aluminum Company of America or its subsidiaries to make these Long piston castings! SA. In the Aluminum Company.

Q. In the records? A. Oh, no, just I saw the pis-

the same the second of the

tons being made.

Q. By the Aluminum Company of America? A. Yes. Then I have seen the castings lying around at the Aluminum Company plants.

(Short reces taken)

Q. In what plant of the Aluminum Company did you see those Long pistons? A. At the Harvard Avenue plant in Cleveland.

Q. What year? A. Oh, I don't know what year;

I think it was around 1920, though.

Q. You say that none of these pistons in this article gave the solution to the problem? A. That is correct.

Q. You regard the Long piston, then, as not being any solution to any problem? A. It is not a solution to the automotive piston problem, no.

Q. Well, do you know of any split piston that was in use before Long, in actual commercial use? A. I don't

know that I do.

Q. The Jardine piston never was in commercial use,

was it? A. I think not.

Q. You know it wasn't in commercial use. You don't know of any car that it has ever been used in?

A. No. I do not.

Q. You don't know of any our that the Gulick piston has ever been used in, do you? A. No, not a niston

like the Gulick drawings.

Q. Yee, that is what I am asking about. Do you know of any car that the Mooers patent piston was ever used in as shown in the drawings? A. No, not as shown in the drawings.

Q. You don't know of any car that the Schmiedeknecht patent was used in? A. No not as shown in the

drawing.

Q. And you don't know of any car that the Schmiedeknecht patent was used in? A. No, not as shown in the drawing.

Q. Then of all of these patents in suit there is only the Maynard patent structure as shown in the drawing that was ever used commercially! A. So far as I know.

Q. And that has not got the relief on the thrust face,

has it!

Mr. Richey: Haven't we been over that enough!

Q. That is, relief in Exhibit 1. A. It has not got the bending in of the webs like in Exhibit 1, at the ends, no; but it has relief around the bosses in combination with the horizontal slot and the vertical slot. Q. Yes. Doctor, you understand what I mean, the relief on the thrust faces, which is the part between the sharp edge of the round part to where the web goes to the wrist pin boss. A. Yes, I understand what you mean; but that is essentially a bending in of the web at the end.

Q. The Maynard patent doesn't illustrate that, does A. It doesn't illustrate that particular point, no.

Q. So when you said that the article represents effort made to solve the problem and that it did not give the public a solution, you counted in your statement the Long piston; is that right? A. Yes.

Q. And you know, don't you, that the Franklin automobile was the worst kind of an automobile to try out an aluminum piston in? A. Why, I know it was a pretty difficult our to put an aluminum piston is.

Q. Well, it was an air-cooled engine, wasn't it! A.

Yes.

Q. And that is about the worst condition that you encounter in automobile practice where you want to use an aluminum piston? A. I think that is true.

Q. And you know that that Long piston was used commercially in the Franklin automobile, don't you!

Mr. Richey: Not the one that was shown in the Gunn article?
The Witness: 'No.

Q. But like Exhibits E and F1 A. Yes, those were used.

Q. And you make a distinction then, between the ones shown in the Gunn article and between the E and F? A. Yes, there is a distinction in the construction and there is a distinction also in the finish of the piston.

Q. The finish of the piston, so far as relief in the region of the wrist pin houses? A. That is correct.

Q. You said a trunk type like shown in Fig. 1 of the Gum article was successful? A. Yes, it was successful to the extent that it was used by the millions prior to the advent of the split skirt piston.

Q. And the construction Fig. 2 was also used, was it not, with the relief in the region of the wrist pin bosses? A. Yes; that happens to be, I think, the Lib-

erty type piston.

The Master: You mean the Liberty airplane motor?

The Witness: Yes.

Q. Now, referring to the Van Bever patent, you d the point that the patent drawing showed a ring inside of that piston which would make the skirt stiff? A. Yes.

Q. But that was promptly left out of the Franklin automobile piston as shown by Exhibit B! A. Yes.

Q. And it operated to some degree anyway, didn't it? A. It gave flexibility to the bottom of the skirt, which has never been any problem as far as I know.

Mr. Richey: Pardon me, was that answered? The Witness: I say, it has never been any problem to get flexibility to the bottom of the skirt, as far as I know.

Q. But as soon as that ring was taken out, the skirt did, at least a part of the skirt, became flexible! A. Yes, the bottom of the skirt.

Q. The function of that ring was to adjust it; isn't

that right? A. Yes.

Q. And hold it rigidly in adjustment; is that right?

That is right.

Q And as soon as you took out that ring, it took out the function of adjustment and the rigidity of adetment? A. That is right; you no longer had Van

Bever, as I see it.

Q. You mean you don't have Van Bever any longer as specifically described in the Exhibit or as shown in

the drawing! A. Yes, or in function.

Q. You don't apply that same rale to the patents in

suit! A. Yes.

Q. You just look at the drawings and any deviation from them is heresy! A. Ob, I think I gave a fair

representation of it; at least I tried to.

Q. New, when you come to the Vincent patent 1,279,164, in the construction shown in Fig. 7, Vincent left out the positive adjusting feature of the Van Bever patent, didn't he? A. Yes.

Q. The spring ring inside didn't hart it any, did it, didn't hart the Vincent construction any! A. Well, it

makes it heavier.

Q. How much heavier! A. I don't know.

Q. Very little; isn't that right? A. Some heavier, at any rate.

Q. Would you say over two per cent heavier? A. I don't know.

Q. Do you know that the Franklin Company med such rings in Exhibit B? A. I never knew it, no,

Q. But it doesn't interfere with the contraction of the skirt, I mean with the closing of the slots to compensate for expansion, dess it? A. It should not.

Q. You said there was no herisontal separation in the Vincent patent construction. Don't you find horizon-tal separation in Figs. 1 and 2, horizontal separation becomposite type of piston, the head in one piece and the skirt in another, and some connection ment and the later

Q. And that is not contemplated by any of the patents in suit, the possibility of a two part piston? A. I don't know whether it is contemplated by any of the patents, but all of these constructions are integral con-

structions that we are dealing with here

Q. What do you think is meant in the Mocers patent in suit, page 2, lines 30, et seq., "It will be undergood that this relationship might be of a poor mechanical fit or joint which would be a poor conductor of heat as compared with the metal of the head 2 and connectors 3, so that such heat as did pass from the head 2 to the skirt I would do so principally by way of connectors 3 rather than from the head to the upper and of the skirt I directly." Do you think that contemplates an integral or two-piece construction? A. Ob. I think that contemplates an integral construction. Certainly the connectorsphe asys, are to be integral with the head and the skirt. I interpret that as merely emphasizing the fact that this hexisontal separation is to be of poor heat conductivity.

Q. A poor mechanical fit or joint, in your opinion then, contemplates an integral construction! A. It says that "its relationship might be that of a poor mechani-eal fit or joint which would be a poor conductor of heat." That is the relationship between the connectors which conduct heat readily, and the horizontal separation which

does not conduct the heat readily.

Q. And that is what you understand by the construction, even though the words "poor mechanical fit or joint" are used? A. I should think so. It says, "this relationship might" do that. It is not that the construction is that; it is the relationship so far as the heat conductivity is concerned.

Q. You think that in the Vincent patent, Figs. 1 and 2 the flew of heat from the head to the skirt would be the same whether the head and skirt were integral or

connected by a joint? A. No.

Q. There will be retardation of the flow of heat, will

there not! A. Yes.

Q. But again, Mr. Vincent doesn't specifically say that the skirt is relieved in the region of the wrist pin

bosses! A. No, he doesn't, as I read it.

Q. Turning next to the Rainforth patent, your position is that it is impractical for the reason that the skirt has to be sprung into the cylinder; in other words, compressed to be sprung in? A. That is one reason, yes. That is what the patent says, it has to be sprung in; that would be impracticable.

Q. That would be impracticable! A. Yes.

Q. Why is that impracticable? A. Oh, if you have enough flexibility so that the piston skirt is sprung in, you wouldn't have enough rigidity to hold the thrust forces.

Q. When Mr. Gulick said that he actually pushed his piston into the cylinder, in his 1911 and 1914 pistons, the pistons were therefore impracticable? A. Oh, every piston has to be pushed into the cylinder.

Q. Well, don't you think that is what Mr. Rainforth

meant? A. Hardly, when he said "sprung."

Q. Well, if a split piaten has to be pushed into the sylinder, there is a springing to a slight amount anyway, isn't there? A. Theremight be in the assembly; they might use the spring comewhat in the assembly. That is not the only thing the matter with this piston, however.

Q. The main thing the matter with this piston is that he doesn't disclose all of the features of each of the patents, is that right! A. The main thing about it is that it just wouldn't be any good, as it has nothing to

commend it for use.

Q. You have never used such a piston, have you?

Q? Have you ever tried one out! A. No. Q. Do you know whether D. Napier & Sons, Ltd.

have tried one out? A. No.

Q. Well, you don't know that they didn't try one out? A. No.

Q. Were you very familiar with the Napier cars of that date! A. No.

Q. How do you know, then, that it was never used

by Napier? A. Ldidn't say that it wasn't.

Q. The only thing that you can say is that you never saw one of these pistons; is that right? A. That is correct.

Q. You don't think it was even an advance in the

art in 19121 A. No.

Q. Did you have in mind when you discussed this patent that the specification disclosed on page 2, lines 7 et seq., and particularly in lines 8 and 9, that these slits 'may, if desired, be extended towards the outer end of the piston so as to be open at that end"! A. I had that in mind, yes.

Q. There is certainly plenty of relief around the wrist pin bosses, isn't there! A: Of a kind, yes. The bearing surface in fact is very meager on that piston.

Q. The diameter of the part below the rings is the same as of the ring lands, isn't it! A. The part below

the rings!

Q., Yes, the diameter of the part below the lowermost ring is the same as the diameter of the other ring land! A. I don't know. The whole head or some part of that head portion must be the upper bearing of the piston on the thrust, in the thrust faces.

Q. You say "must be" A. Yes.

Q. Why do you say "must be"!! A. Why, because there couldn't possibly be a complete bearing below the boss; so there must be a bearing some place above the boss, and it has to be some place around those ring lands. There is not enough strength, wouldn't be in any metal of any construction, even today, without those vertical slots to hold the bearing of the piston entirely below the

Q. Do you know that from experience or from theory! A. Oh, I know it from experience and from theory.

Q. Experience with this particular piston? A. No,

experience with pistons.

Q. But the mere fact that the piston is sprung into the cylinder, and with the slots made wide enough, that doesn't mean that it would seize! A. No, not necessarily. The metal might be so thin that it has a lot of spring.

Q. What do you gather from the following statement in the patent, at page 2, lines 13, et seq.: "Again a U-shaped alit may be formed in the outer portion of the piston, the length of the U being transverse to the axis of the piston, and transverse slits may be arranged in a variety of ways to produce springy tongue-like portions which shall produce the required result in a manner simiar to that in which the slits D act." A. Just a sort of war on words with the exception of the specific U-shaped

portion that it described.

Q. When the specification says: "The transverse slit may be arranged in a variety of ways," that is where you stop? A. Yes. It is like trying to reach somebody by telephone when you don't know his number, and starting with the dial. tel per mi sur me l'india de

Q. You have no imagination to figure out in your own mind that the fellow meant anything else but a U-slot with its axis transverse to the piston; that is all you could gather? A. Nobody else ever seemed to

gather anything.

Q. I am asking you what you gather? A. I would be just probably like the other people, only not as good as a lot of these inventors that worked on this problem. It seemed to teach nobody anything

Q. That is all you personally gather out of it, that the U was only transverse and made exactly to a level of the piston? A. What difference does that make?

Q. I am asking you. Then you can ask me some questions. (Question read by reporter.) A. No, I would even give it considerably more leeway; still he wouldn't have anything.

Q. Now, taking up the Spillman patent 1,325,176, your statement about that piston was that it was just no

good! A. Yes, that is night.

Q. You know it has been manufactured by the Kant Skore Company of Cincinnati? A. Yes.

Q. For a good many years! A. I don't know how

long.

Q. Well, you know that it was the piston, that it was that particular piaton which was involved in the suit that the Aluminum Company of America filed against the Kant Skore Company in 1923, and it was tried, I think, in 1923. You know that, don't you? A. The Aluminum Company filed—I don't remember that.
Q. Well, I can't remember all these subsidiaries—

Aluminum Manufacturers. I believe it was at that time.

was the name given to the subsidiary. A. Well, I think that suit was on the process patent.

Q. Yes, but the particular piston which was an exhibit in that case was exactly like Exhibit 3-21 A. Yes. I don't know that I recall that there was such an exhibit, but there may have been.

Q. Well, you testified as an expert in that case. didn't you, Doctor? A. Yes, But I don't know what exhibits were in the case, and if we had a piston like this before me, then I was thinking of it more from the stand-point of the atructure of the metal in the piston and the process by which the piston had been made, rather than CONTRACTOR OF STREET

Q. Well, one of those patents involved a piston having a definite alloy of aluminum, copper, and magnesium,

and other trimmings! A. Yes.

Q. You don't even remember that you had that pis-

ton before you, or a piston exactly like that, a finished piston, when you testified? A. No, I don't remember that . The in the last the additional areas in the

Q. You can't say then whether that piston was the one whose manufacture by Kant Skore Company cansed the Aluminum Company to bring that suit? A. No, I can't say that, I idon't know at the mountait just which piston castings were involved, but I know that the Kant Skore Company, made these pistons, made pistons like

Q. Ob, you dof A. Ob, yes. Q. You know that they made those and sold them in 1923 around the time of the suit! A. Well, I don't

know in 1923, but some time around 1923 or earlier.

Q. Well, the Akuminum Company of America or any of the subsidiaries, or Ahminum Remainsturers, wouldn't have brought suit and gone to the axpense of bringing unit had the company put onto perfectly we the less thing which would put them into the hands of re-ceivers anyway! A. Why, yes, I think so. That is one of the things they munted to guard against, having worthless things go out onto the market.

dear public, to bring that suit? A. No, it was a business

properition.

Q. It was a straight husiness proposition! A. Yes,

certainly.

Q. You know, don't you, that the Cleveland Trust Company, or The Cleveland Trust Company through the Aluminum Company of America, or through Aluminum Manufacturers, has been collecting royalty from Kant Skore on that particular piston? A. No, I den't know that we form

Q. You don't know that? A. No.

Q. You can distinguish then between the collapsing effect of 3-Z and 48, can you! A. Yes. I know that type 3-Z piston collapses. I have seen a good many of them in the collapsed condition. Of course aluminum collapses a good deal easier than cast iron anyway.

Q. The mean by that that the 48 wouldn't be suitable for aiuntinum, Exhibit 481 A. 48 wouldn't be so

good for aluminum.

Q. Would you say, as you said about the Kant Shore piston, that Exhibit 48 is just no good! A. No. I wouldn't say that.

Q. But you say Exhibit 3-Z is no good? A. Yes,

Q. In spite of the fact that Exhibit 3-Z has got reliefs on it and Exhibit 48 has not? A. That is correct.

Q. One of your objections to the Spillman patent structure 1.325,176, and 3-Z is that it has slots on both sides which makes it worse! A. That is right.

Q. They could have been left out on one side,

couldn't they! A. Yes.

Q. And that is done by the licensees under the Jardine patent, even if the Jardine patent does show two alots! A. Yes.

Q. Did you say that the Kant Shore Company went to be manufactors of a piston like Exhibit 11 A. Yes.

Q. And also the strut piston? A. Yes.

Q. Now, that Exhibit I was being used by the Ford Motor Company! A That Exhibit 1 was being used by the Ford Motor Company, that is the Ford pinton.

Q. Adopted as standard equipment! A. Yes. Q. And it is a little bit hard to sell a jobber or a dealer anything except standard equipment? A. I don't

Q. But that was an advantage to out down sales resistance that Kant Skove could put out a duplicate Ford piston or duplicate the car manufacturer's piston generally! A. I should say that was an advantage.

Q. What is the first split piston you ever saw in commercial use? I will limit it to that. A. Any kind of

split!

Q. Yes, any kind of split. A. The Franklin, with the bottom of the skirt split.

Q. Like Erhibit B! A. Yes.

Q. And that was followed by the Long piston, wasn't it! A. Yes.

Q. And that was followed by the Kant Shore piston? A. Oh, you mean that was followed in my experience by the Long piston?

Q. Yes. A. Oh, I don't remember the second split skirt piston that I saw; but I think it was Jardine, was

the second one.

Q. Like the Jardine patent in suit! A. Yes.

Q. Taking up next the Long patent 1,395,441, you say as you read that patent, the skirt is the same diameter all the way up to the ring groove 27 A. Yes.

Q. That is the way you understand it? A. Yes.

Q. That is what you understand the world "adjacent" to meen!

jacent" to mean? A. Oh, it may mean a variety of things; it usually means near.

Q. It means "neighboring," doesn't fit! A. Yes.

Q. Now, when the statement is made on page 2 of the specification, lines 4 et seq., "In a piston of this im-proved character it is preferable to have the solid end 1 of the piston of a lesser diameter across the peripheral surface adjacent the piston ring recesses 2 than the remaining lower portions of said skirt." A. Where do you see "said skirt"!

Q. Oh, the "lower portion of the piston." Thank you. What are the parts adjacent the lower ring groove 2, only the upper part? A. No, both parts are ad-

jacent.

Q. And if anybody told you to have the solid end of the piston of lesser diameter across the peripheral surface adjacent the piston ring recesses than the re-maining lower portion of the piston, you would stop right at the lowest ring groove! A. Well, I think that is where the line should be drawn, particularly in view, in this case, of Long's other two patents, one of which appears to be about the same date of filing as this one, in which he actually shows the head relief extending up to the horisontal slot.

Q. There is no question about the disclosure in the Long patent 1,489,499 and 1,872,772, as to how far the reduced diameter goes depri! A. None at all.

Q. To the top of the slots! A. That is correct. Such an important point in that patent 1,395,441 should

be singled out and pointed out.

Q. If you had these two patents before you, filed on the same day, 1,395,441 and 1,489,499, you would absorbe lutely close your eyes to the statement in the second patent in considering the first one! A. No, I think I would open my eyes.

Q. You would open your eyes and you would actually use the same feature in the first patent that you would in the second; isn't that right? A. No. I don't believe I would. It think the two constructions are different. One is a double-walled structure; the other a single-walled atructure.

Q. Whether double-walled or single?

Mr. Richey: Just a minute. Let him answer. The Witn ss: I think that a point as important as that in patent 1,395,441 should be sengted out as carefully and is in the other patents.

Q. It should be repeated in every patent thereafter to the end of time; is that right? A. This wann't a patent thereafter; it was a patent application that was

concurrent with the others.

Q. I metice that neither one of these Long patents 1,385,441 and 1,489,400 show that there are oil holes in the wrist pin besses. Don't you think that is a vital defect and therefore that the whole thing would sens?

A. It is not an important point in what he thought was his invention.

Q. You don't think that is sufficient, then to permit you to throw both of these Long patents out? A. Not on

that ground, no.

Q. Suppose the Long patent structure, the one in 1,000,441 was need with the skirt of uniform diameter and you ethered to run it in a sylinder, wear would take place, wouldn't if? A. Yes.

Q. That would reduce the skirt in the region of the wrist pur bonce, just soulf it of? A. Why not,—I think it would reduce the skirt mostly in the upper part rather than around the wrist pin bonce.

Q. You don't think there is any chance then of this diametrical expansion pushing out the wrist pin bonce you have been taking about with reference to all these patents, especially since there in a slot apparation on both sides? A. Oh, the wrist pin relief in combination with those other things would be helpful, but it depends on the clearance the piston is fitted in the sylinder, among other clearance the piston is fitted in the cylinder, among other things.

Q. Well, whether you had relief or not, the skirt ald expand in the region of the wrist pin bosses more rould expand in the region of the wrist pin b han at right angles to it? A. Yes, it would

than at m

Q. And it would begin to wear down, wouldn't if? A. It would bear against the cylinder there.

Q. And in the end you would have relief opposite the wrist pin bosses? A. Oh, I would hardly call that relief opposite the wrist pin bosses. You would also have some flexibility at the bottom of the skirt which would help push the boss region in in response to cylinder wall pressure in this pisten.

Q. And the little marrow part above the slot 9a, Fig. 2, would wear off very rapidly, wouldn't it, if it wasn't of full skirt dismeter! A. It might, if the clear-

ance was small

Q. But the parts bounded by the slots 9 and 9a

would fier in? A. Yee, they would.

O. Now, one of your objections to the Long patent 1,395,441 was that it has complicated slotting as shown in Fig.1. That was one of your objections, wasn't

shown in Fig. 1. That was one of your objections, wasn't it? A Yes.

Q. Resding the patent do you think that one skilled in the art would inevitably come to the conclusion that you had to use that particular slotting of I with the particular slotting of Fig. 2? A. Do you have reference to any particular part of the patent?

Q. No. But resding the whole patent reading the patent and booking at the drawings, was it your idea in reading this patent that you had to use those two together! A. Wall, the patent oppours to be quite specific in its description of the drawings.

Q. It is your idea then, is it, Dooter, as you read patents like the Long patent and others, that you should not deviate one lift from it; that you should be sure to put Fig. 1 on one side and Fig. 2 on the other side of the piston?

Mr. Richer: I object as indefinite, unless the

Mr. Bickey: Il object as indefinite, unless he says what other patents he means.
Mr. Brunings: Well, strike out "other patenta: "

A. No, I think that the patent should be read not only with the idea of its construction, but the mode of operation and the results in mind.

Q. Just answer my question.

(Question road as amouded.)

A. I think that is an answer, isn't it, to your ques-

tion f Q. Your idea then, is I want to make it clear without a lot of explanation that as you gather the patent, you wouldn't have to put Fig. 1 on one side and Fig. 2 on the other side; you as one skilled in the art would know that? A. No, I think not from this patent, miless there is something in the description itself that guides one in that direction.

Q. What is the difference between the Long patent 1,395,441 and Exhibit CCC! A. One difference in that in Exhibit CCC there is horizontal slotting on both sides of the piston, the horizontal slots separating the head section from the skirt section, whereas in the Long patent 1,395,441 the horisontal alots are in the upper part of the piston. The Exhibit CCC has only one vertical slot in one thrust face, and the other thrust face is left solid: that is another difference. Another difference is that the Exhibit CCC has generous relief around the bosses and extending to the top of the skirt, and the relief overlaps the horizontal slot on both sides of the piston. Exhibit CCC has combinations of elements, therefore, not found in Long. It also has a construction different from Long, ould have a different mode of operation and would and w give different results.

Q. But if the Long patent had added to it those features that you distinguish from it, there would be no difference? A. Axiomatically, so, if one made the CCC pisson and incorporated the changes necessary to make it, and called it 'Long," what you say would be true.

Q. But those three distinctions that you just gave

me are the only three distinctions you can think of? A.

Weil, those are the essential differences, as I see it.

Q. And the first of them is don to the fact that since the lower ring land in Exhibit CCO is reduced in diameter to the same diameter as the ring land- A. Yes.

Q. —that therefore there is a separation of head

and skirt! A. That is correct.

Q. The second one is that there is a relief in the region of the wrist pin bosses which is specifically described in the Long patent? A. Yes, except that relief is quite special in the CCC piston; it extends clear to the top of the skirt and overlaps the horizontal slots, which gives a combination of structural elements producing beneficial results.

Q. And the third one is that the slots 4-4 and 8, Fig. 1 of the Lang patent have been left off of CCC1 A. Yes.

(Therespon, adjournment was taken to 1:30 P. M. of the same day, Tuesday.)

(At this point the testimony of Tibbetts, Record pages 877 to 895, was taken.)

(Thereupon at 9:30 A. M., Wednesday, March 22, 1933, the hearing was resumed.)

ZAY JEFFRENS resumed the stand for further Caoss EXAMINATION.

Q. You were talking about the Long patent when we adjourned, Doctor, but I want to go back to the Monekmeier piston for just a little bit. When does an iron piston begin to pick up earbon? Oh, you can state it generally the time, distance, number of hundreds or thousands of miles. A. It is not a question of mileage; it is a question of temperature.

Q. It might pick it up in one day! .A. Yes, yes, it might pick up carbon in one day.

Q. In noticeable, permanent deposits, hard? A. Yes. Q. That is your opinion? A. Yes; the carbon isn't a question of time; it is a question of temperature and

running conditions, and oil.

Q. In other words, you think that in the course of maybe an hour's running, an iron piston could collect carbon deposits of carbon which would have to be scraped off! A. Oh, I think so. As a matter of antomotive engineering there are two temperature ranges that are critical in carbon deposits; one is that the parts should be kept below a certain temperature and then it will not carbonize; it should be kept above a certain temperature, and then it will not carbonize. It should be kept above a certain temperature, and then it will not carbonise. The piston hends sometimes get so het that the carbon will not deposit on them; that is the upper temperature level.

Q. And you say that is not only true of the head, but down along the skirt say below the wrist pin boss on a piston like the Monckmeier piston 3-V1 A. No, that can never get so hot that the piston will not carbonize.

Q. What do you say, how long it would take to cause a deposit of hard, fairly permanent carbon on it that would ha to be scraped off in order to get it off! A. I don't know. The matter of the hard deposit is one in which the temperature also plays a part, but the accumulation of carbon of course becomes much greater as time goes on. That is, a small deposit of carbon some times makes it easier for the next deposit to take place,

and so on, until the deposit builds up to the point where it flakes off, some times in the motor, or where it builds up to quite a thickness and becomes objectionable in the operation of the motor.

Q. Now, what causes the deposit of carbon on the head of a cast iron piston? A. It is the charring of oil

shich gets onto the head of the piston.

Q. It is a regular frying process, like putting oil in

a frying pan, isn't it! A. Yes, a good deal.

Q. Now, that extends for some distance along the ston, along the sides of the piston? A. That may, or he carbon from the flame may be carried down the piston by the gases. Of course any kind of yellow flame is just full of earbon, full of soot.

Q. And that frying process is the greatest af the hottest spot, ian't it! A. No, at the hottest spots the oil can completely volatilize; that is, a piston head can be hot enough so that the carbon will not deposit on it.

Q. That didn't happen in 3 V, because there is carbon on the head? A. Well, it didn't happen at some

stage of 3 V or in all parts of 3-V.

Q. But an actual frying process did happen in 3.V1

A. I think so, yes

Q. And an actual frying process also happened in the region of the wrist pin bosses? A. Oh, I couldn't say that; I don't know.

Q. There is where the greatest amount of carbon is on the Monthmeter piston, isn't it? A. No.
Q. Apart from the head? A. Oh, spart from the head. Well, apart from the ring grooves, too, and that deposit is very thin.

Q. But that deposit in the region of the wrist pin bosess is the greatest on the entire skirt; isn't that right?

A. It is the most evident.

Q. And that is the hottest part of the skirt if you have connectors and slots in it? A. Yes, it would be.

Q. Doesn't that to your mind, Dr. Jeffries, prove that piston actually did run with the slots in it so that the hottest part of the piston was right in the region of the connectors where the greatest amount of earbon was deposited! A. No, that doesn't prove that at all. There is another reason why sarbon might be deposited there, and that is the weaving of the skirt as a result of the wrist pin pressures, would have a tendency to have that adhere there and to make cavities for the oil to get in. There are also two little oil grooves there for the oil to run. There is no way, as I mentioned on my direct examination for me to tell whether the slots were in the piston where it was being run or whether they weren't, and I don't think it makes any difference as far as that is concerned; but the evidence on the piston itself is in the direction that the slots were put in after the piston had been run, such evidence as I can gather.

Q. Such evidence as you can gather. There is none whatsoever that they might have been run for several hundred or a thousand unles with the slots in them? A. Not the slightest, no more than the deposit of carbon around the bosses of Defendants' Exhibit 3-H piston es of Defendants' Exhibit 3-H piston would indicate that the skirt had to be slotted while the piston was being run.

Q. It is a fact, isn't it, that if those slots are in 3-V, those cross slots are in 3-V, the hottest part of the skirt is right in the region of the wrist pin bosses? A. That

is correct.

O. It is also a fast inn't it, that these slots are in there and if you have a splash system, oil can splash into those slots and to some extent start that frying process in those slots? A. Yes, to some extent. But if that were the case, the cil-would be spread over certainly the upper surface of both of the horisontial slots, and that portion would be hotter than the skirt portion adjacent the besses, and that should have charred and produced carbon in these slots.

Q. In an automobile having a crank case and where you have splash inbrication, there is a continual fog of oil in that crank case and going up into the piston, isn't

that right? A. There should be at each strake.

Q. Well, at each stroke that may be true, but the pistons run so fast that there is a continual fog right inside of those pistons; inn't that right? A. Well, I don't know what the conditions were there; but I do say that if the conditions were right for charring at this particular point, the end of the horizontal slot near the boss which is not cracked, then the condition should have been right for charring 1/16" or 1/32" from that particular point in the upper surface of the horizontal slots.

Q. Now then, to get a clear picture of the piston, particularly a cast iron piston, still more particularly Exhibit 3-V, the hottest part of that piston is the head?

A. Yes.

Q. The top of the head; and then the temperature gradient goes down, the hottest part of the skirt in a piston like 3-V is in the region of the wrist pin bosses below the connectors; let's call them connectors; that is right, isn't it! A. That is correct.

Q. And in such a piston like 3-V, slotted as you have it here, the coolest part of the skirt is below the horizontal slots? A. Oh, the coolest part of the skirt is the bottom of the skirt. The coolest part of the top of the skirt is just below the horizontal slots. I would like you to keep in mind in these answers that these horizontal slots do not make the usual head-skirt separation in Exhibit 3-V. The head-skirt separation, that is the guide section, goes up at least to the lands on either side of the top.

Q. Yes, I am taking your answer with that reservation when I am talking about the skirt, I was talking about the skirt part below the horizontal grooves. A.

Yes.

Q. And the grooves themselves as well as the lands in the piston are continually subjected to oil or spray or splash? A. Yes, they should be; so is the cylinder wall, which continually subjects the outside of the piston to oil.

Q. Now, you called particularly attention to the pistons Exhibit F and Exhibit E the Long pistons, and the collection of carbon deposit on those pistons, particularly in the slots. You have every reason to believe that those pistons were run in a Franklin air-cooled engine? A. Yes.

Q. And that the cylinder of that engine becomes

very hot, does it not? A. Yes, it gets quite hot.

Q. Much hotter than a water-cooled engine? A. Well, hotter than most of the pleasure car water-cooled engines, ves.

Q. You would rather expect more deposit of carbon in a piston in an air-cooled engine than in a water-cooled engine, wouldn't you? A. In certain parts, yes;

not necessarily on the head.

Q. Examine Exhibit 48 and tell me whether after the cutting of that slot there is not evidence of a springing of one part with respect to the other, especially at the top! A. Yes, there is.

Q. That takes place when you split a cast iron piston? A. Some times it does and some times it does not.

Q. That springing may be either in or out? A. Yes, it may be either in or out.

Q. Depending on the strains that are set up during

the casting; is that right? A. That is correct.

Q. And such a thing could just as well happen in the Monckmeier cast iron piston, Exhibit 3-V? A. Yes, it might. Q. One of the advantages of an aluminum piston is that it will conduct heat quickly; isn't that right! A. Yes.

Q. And a cast iron pistor will not conduct heat nearly as quickly as an aluminum piston? A. No; about

one-third I think.

Q. A cast iron piston therefore runs at a higher temperature than an aluminum piston in actual service under the same conditions? A. Under the same motor conditions, that is correct.

Q. And therefore the liability to deposit carbon on a cast iron piston is much greater than where an alumi-

num piston is used? A. In the lower range, yes.

Q. What do you mean by the lower range? A. Well, I mean that with the lower temperatures encountered in the motors it is easier for a cast iron piston head to be heated hot enough so that it will not take a carbon deposit than does an aluminum head.

Q. Where a cylinder is run at a rather high temperature, there is considerable wall warpage, isn't there?

A. There may be; there may not be.

Q. Now, if the Monckmeier piston, particularly 3-V, had not been reduced in diameter above the slot, that narrow ledge would soon wear off, wouldn't it? A. Well, I don't know how soon it would start to wear, because that would be the wearing of the upper part of the piston.

Q. Well, as an extreme, if it came to a point, it would wear off very quickly? A. Well, it might break off in

that case.

Q. And the quickness of wear is determined by the vertical depth of that ledge, or I might say annular part between the lowest ring groove and the horizontal slot? A. That is one factor. The kind of use it has is another factor, and the degree of oiling is another factor. There are a lot of factors involved in wear. The amount of dust that gets into the carburetor is more important than any of the other factors.

Q. But if that wear did take place, it did not necessarily mean that the wings, what I might call wings, that is, the free part bounded by the horizontal and vertical slots, the wings could flex in? A. The wings, if they were slotted during the time when the piston was in the

motort

Q. Yes. A. Oh, they would have to flex. That piston, if it were slotted in use, that bottom of the skirt would have been quite flexible, and nothing could have prevented the bottom part of this piston from flexing

during the operation; but during the wearing off of this annular part above the slot, the side sections of the piston bounded by the horizontal slots and the vertical slots would be allowed to flex in while this wear of this annular part took place, that is true; it would have no part, however, in helping the piston to operate, because if the piston were slotted, the slotted part would wear just the same as the other part.

Q. But then as the wear took place, the slap would not increase, would it, as the wear on this annular part took place, these parts would still flex in and slap not take place? A. Oh, no, I don't think that is correct.

Q. You don't think so! A. No. I don't think that is correct. There has been ample clearance in that pis-

ton, slots or no slots.

Q. You say ample clearance because Mr. Monckmeier said it was fifteen thousandths! A. Well, measurements indicate it wasn't fifteen thousandths. The measurements indicate it was twenty thousandths or more, even when the piston was new, and a good deal more than that later.

Q. You my twenty thousandths because you figure just about what the wear might have been? A. No, no; I say twenty-thousandths because the motor was sup-

posed to be a 41/2" bore motor.

Q. And you don't know what the diameter of that piston was when it was put in! A Well, it wasn't arge diameter, from the diameter across the boss faces on the skirt.

Q. You don't think there might have been wear across the boss faces? A. Not on the skirt, not very

much.

Q. Then all of your talk about relief isn't so important, that is, relief in the region of the wrist pin bosses? A. Not when you have clearance like that, not when you have clearance enough to allow the piston to be heated 700° hotter than the cylinder, then the whole thing is relieved.

Q. Now, in an engine of the size of the Staver engine that you heard Mr. Monckmeier talk about, having only splash lubrication, that lubrication wasn't very efficient,

was it? A. Yes, it is quite efficient.

Q. Splash Inbrication! A. Yes, for Inbrication. It is not very efficient for oil consumption, but it is very

Q. Isn't it a fact that at high speed the cranks make almost a hole in that oil? A. Well, I know that to get

the best inbriention, especially with some of these aluminum pistons, they found the splash system to be preferable. It is not good for oil consumption from the standpoint of number of miles run per gallon of lubricating oil consumed; but it is quite efficient from the standpoint of doing a good job of lubricating.

Q. When a piston seizes, it usually seizes at the skirt, doesn't it? A. It usually seizes at the top of the

skirt, yes.

Q. And with considerable wear of a piston such as Exhibit 3-V you would expect the diameter above and below the slot to be equal; isn't that right, after considerable wear? A. Not quite. The portion above the skirt is hotter, the portion above the horizontal slots is hotter; therefore in operation it would rub the cylinder a little harder than the portion below, and after the piston cooled down to room temperature, then that portion above should be a little less in diameter as a result of wear.

Q. In order that the master may have an idea of the measurements, what is the thickness of an ordinary piece of writing paper? A. I don't know that I have ever measured it.

Q. Do you know what the thickness of an ordinary piece of cigarette paper is? A. No.

Q. Do you know what the thickness of an ordinary

hair is! A. Yes.

Q. What is it? A. Erom one thousandth to four thousandths of an inch.

Q. Now, you took these measurements of Exhibits 3-V and 3-W, and particularly 3-V. That is pretty rusty, isn't it? A. Yes.

Q. The rust on each face might be over a thousandth of an inch! A. Oh, around a thousandth, may be, yes. I can conceive of a thousandth variation in any one of the measurements that I took.

Q. Well, that was particularly true in the region of the wrist pin bosses where the carbon collected? A. Oh, most any place, I think, on the piston. The rusty surface is not conducive to fine or close measurements.

Q. I believe it would be well to explain the present method of oiling pistons as used in engines, pick out any one in which there is a direct oiling of the pistons as distinguished from splash lubrication, or in addition to splash lubrication? A. Well, there is one in which the connecting red is made hollow throughout its length, and oil is forced through this hollow connecting red up to the

wrist pin section and sprayed out into the interior of the piston during operation. That is not the most common type, however. I think the most common type is one in which the oil pressure is developed by a pumping system and at each revolution of the crank shaft a little jet of oil is squirted under pressure up into the cylinder bore. It produces what Mr. Brunings has called a sort of fog or spray of oil in the bore of the cylinder.

Q. Now, let's continue with the Long patent 1,489,-490. Look at Fig. 5. Is it your contention that there is no flexure of the web 8a during operation? A. Well, the webs would flex, yes, in the boss axis, but there is no flexibility of the webs in the thrust axis, as I see it.

Q. As the metal part of part 4, Fig. 5, between 8a, and 8a expands, the webs must flex? A. That is not a flexing of the webs, that is merely a change in position

due to increase in temperature.

Q. Well, if there is no relief in the region of the vrist pin bosses, and with the skirt in the region of the wrist pin bosses bearing against the cylinder, and with these bosses again supported from the top of the skirt, don't those webs 8a actually have to flex as the expansion of 4 takes place with increase in temperature? A. Oh, no, they couldn't flex as the result of any change in the part 4. They would be flexible in the other direction, to an extent, that is, across the boss axis.

C. They would flex along the boss axis, wouldn't they? A. Yes, they should, and the lower on the piston the greater the flexing, and by the time you reach the top

of the skirt that would be very small.

Q. Would about the same flexing take place in the part 11, Fig. 4 of the Gulick patent, between the webs 17 and 18? A. Oh, no. The flexing in those Gulick webs

would be very substantial.

Q. Because designed for flexing? A. Yes, and because of the complete horizontal separation and the vertical separation between the two webs. That construction is all in the direction of making the Culick structure flex.

Q. You keep in mind, of course, that the part 4 is separated both vertically and horizontally from the rest of the piston in the Long patent 1,489,4991 A. Yes.

Q. You don't think that is comparable at all with the parts 11, 17 and 18 of the Gulick patent, Fig. 4? A. No. No. I think if you took out the two slots, 5, and put in one right in the region of the figure 4, then those webs

would operate more like the Guliek webs, but as they are I don't see how they can.

Q. That is, if you took out the slots 5 in the Long patent, then flexing would take place? A. Oh, by putting

in the slots in the right place.

Q. Now, your objection to this patent, at least one of the objections is that it is a double-walled structure. By that you mean it cannot be conveniently cast in a permanent mold? A. That is one of the objections to the double-walled structure, yes.

Q. You don't see any difficulty in making cores for that piston, do you, permanent mold cores? A. Yes,

there would be difficulty.

Q. But it could be done, couldn't it? A. Possibly.

Q. As a matter of fact it is a simpler proposition than Exhibit E, assuming of course the slots will be cut later on in both cases? A. Yes, I should think it could be made as easily as Exhibit E.

Q. And Exhibit E is no doubt a permanent mold cast piston? A. Yes, it was cast in a permanent mold.

Q. Now, turning to the Long patent 1,872,772, one of your objections to this patent was it was too complicated. Is it more complicated than the Gulick patent structure? A. It is perhaps not more complicated in its structure, but it is more complicated in its operation.

Q. The fact is that it can be cast in a permanent

mold? A. Yes, with difficulty.

Q. While Gulick's could not? A. That is my opinion, yes. The Gulick drawings, as shown in the Gulick

patent, could not be cast in a permanent mold.

Q. Why do you say, "With difficulty," Doctor? How much experience have you had in casting pistons like Exhibit E? A. Well, I haven't had very much personal experience in casting pistons like Exhibit E, but I have had a lot of personal experience in casting pistons in permanent molds. I know this is regarded as a difficult permanent mold job.

Q. But Mr. Long was selling those pistons in competition with Cleveland Trust Company's licensees, wasn't he! A. I don't know whether he was or not.

Q. Well, you know that Mr. Long was sued for infringement of the Cleveland Trust Company pistons because he was manufacturing pistons of that kied, don't you! A. No. I didn't know that.

Q. It has been said here by Mr. McCoy that the suit was dismissed after Long agreed to be good and buy

his castings from licensees. I believe you heard that, didn't you? A. I don't recall. I didn't pay any attention to it if I did hear it.

Q. Do you know anything about that? A. No.

Q. If I am not mistaken the reference was at that time had to Exhibit FFF. That is really a fine piece of work, isn't it, so far as permanent mold casting is concerned? A. Yes, that is a very fine piece of casting.

Q. Well, suppose it is complicated and suppose it is difficult to cast, what does that mean—increase in cost?

A. Yes, very substantially.

Q. What do you call "substantial"? A. Well, I mean that a piston like that would be too expensive to

use in motor cars generally.

Q. It wasn't found too expensive to use, was it?
A. Apparently wasn't for a time in the Franklin Motor
Car, but that is a high priced car and was at the time
that these pistons were being used in it.

Q. But still Franklin continued to use those pistons

until 19261 A. Yes.

Q. And as early as 1922 the Maynard type piston

was on the market, wasn't it? A. Yes.

Q. And to your knowledge not a single Maynard type piston has been used in the Franklin car, has it?

A. Not without the other modifications, at least.

1Q. What other modifications? A. Well, with the

Invar Strats.

Q. Oh, you call that Invar Strat pistons Maynard type piston? A. No, I don't call it a Maynard type pis-

ton, but it may have some Maynard features in it.

Q. Then your objection to a double-walled structure is the complication of casting, isn't that right, that is what it comes down to? A. Oh, that is one, and extra weight is another. It is not so economical or commercial as the single-walled structure.

Q. And all of those objections also go to the Gulick piston as illustrated in the drawings? A. Yes, that is true, but there are other features of complications in the Long piston and in its structure and its mode of operation which do not apply to the Gulick construction.

Q. In spite of that fact Long has been on the market and Gulick has not? A. The Long type of piston has been on the market and the Gulick type piston, as shown in the Gulick drawings, has not been on the market.

Q. And one of your objections to the Long patent is, again, that it does not describe relief in the region of

the wrist pin bosses! A. That is correct, it does not describe such relief in combination with other features, such as horisontal and vertical slots, to gain skirt flexibility.

Q: But it does clearly disclose, without any question, the reduction in diameter of the piston to the top

of the horizontal slot? A. Yes, it does.

Q. I believe I understood you to say if that feature was used relief in the region of the wrist pin bosses was not so necessary! A. No. it would not be so necessary as it would be in the other Long construction which we were discussing; it would still be helpful however.

Q. Now, you took up Exhibits E and F and then selected the sand cast piston, and you made a number of observations as to improper operation, carbon collecting on it, and all of that. You knew of course that Exhibit F is a sand cast piston, don't you? A. It is a sand cast interior, at any rate; and I don't know that it is a sand cast exterior, however.

Q. You don't find those objectionable features as to the blow-bys and collection of carbon, and scoring and so forth, on Exhibit E, the die casting, do you? A. Not to the same extent, the wearing surface is in pretty good

shape in Exhibit E.

Q. You don't find the side at the bottom of Exhibit

E has collapsed in ! A. No. . .

Q. You don't find hard rubbing opposite the webs,

do you! A. No.

Q. What do you think caused that in Exhibit F. the sand cast piston? A. Well, it is a combination of clearance and temperature, has been such that the wall pressure has been high during operation in Exhibit F. and there is no evidence of very high wall pressure in Exhibit E. I have seen many trunk type pistons with no slots at all that have the same kind of surface as Exhibit E. Among other things, it is a matter of how much clearance the piston is given and the effectiveness of the lubrication.

Q. As a matter of fact, the hard rubbing opposite the webs was caused by the fact, really, that the webs expanded out and pushed that cylindrical part against the cylinder, im't that right? A. Yes. But in order to do that the wells had to become quite hot, or the clear-

ance of the piston had to be relatively small.

Q. What do you say, do you think the webs weren't flexible enough? You have the piston before you, so you ought to be able to tell something about it? A. No, there

is flexibility in the webs.

Q. But still there is this rubbing, apparently due to expansion of the webs outwardly? A. Yes, but as I have mentioned before, that is a matter of the design of the piston and also the clearance with which it is fitted. One can fit the Maynard piston so that it seizes this way or rubs this way. No piston construction is in itself a cure all against piston troubles. The piston has to be fitted in a certain way. My thought in this was that it was perhaps fitted or intended to be fitted so it would not slap, but it apparently was not fitted loose enough for that particular piston under the conditions of operation.

Q. You made the outright statement that the piston didn't function properly in service. Did you have that piston F in mind or the Long pistons generally? A. No, I had the piston F in mind particularly, and I think I was describing the collapsing of one of the side walls of this piston and the scoring on the thrust faces.

Q. You didn't have the Long pistons generally in mind, did you? A. I don't think I had them generally in mind with that statement, but generally speaking, the

Long pistons were not satisfactory.

Q. What do you base that on? A. I base that on my general piston experience and with the information that I have got from time to time with respect to pis-

tons in operation in the United States.

Q. From whom did you get the information with reference to the Long pistons in the Franklin engines?

A. I got it from the automotive engineers of the Aluminum Company.

Q. Oh, the automotive engineers of the Aluminum

Company ! A. Yes.

Q. Of course they were boosting the Long pistons, were they not? A. Oh, they weren't; but they were continually in touch with the Franklin Company and would come back with repeated tales of how they weren't satisfied with their pistons.

Q. And I suppose the Aluminum Company offered the Franklin Company a better piston than the Long

pistons. A. Yes, they eventually did.

Q. In 19261 A. Yes, it was earlier than that that

they offered them a better piston,

Q. Why didn't the Franklin Company take a better piston earlier than that? A. Oh, they had quite a period

of testing. I don't know just why they didn't make the change earlier.

Q. Was the Gulick piston offered to them just exact-

ly as shown in the drawings? A. No.

Q. Wasn't the Jardine piston shown to them just

as shown in that drawing? A. No.

Q. As a matter of fact it was shown to them just as shown in that drawing, wasn't it? A. Not that I know of

Q. And don't you know the Franklin Company would not have the Jardine piston! A. No. I didn't.

Q. Do you know whether the Maynard patent piston was offered to the Franklin Company! A. No, I don't knew whether it was or not.

Q. And then finally in 1926 the Franklin Company turned over to the strut piston! A. That is correct. In so far as I know, they haven't complained since.

Q. Did you say that the Aluminum Company of America made castings for the Franklin Company from 1920 to 1926 for those Long pistons? A. Well, I don't know the exact date, but they made castings for the Franklin Company from about 1920, as I recall it, to about 1926.

Q. And that Long piston was a more expensive piston than either the Jardine or the Maynard piston? A. Yes. They paid, I know, considerably more for their

castings than they would have for the others.

Q. And in addition paid Mr. Long a substantial roy-

A. So I understand.

Q. And you can't explain that at all, can you, why the Franklin Company should pay a higher price for the Long pistons and pay Mr. Long a royalty, when the Jardine and the Maynard pistons were available to the Franklin Company for a period of from five to six years?

A. No, I really can't explain it.

Q. You cannot offer any explanation at all? A. No. Nor can I offer the explanation why they slotted the bottoms of the skirt of the old Franklin type pis-

ton.

Q. But you do gather from all of that that the Long piston was no good, while the Jardine and Maynard patent pistons were far superior? A. The Maynard piston is far superior for general purposes; there is not any question about that. So far as the application in the Franklin car is concerned, I can't say. I do know from my own experience that Franklin was complaining about piston trouble from 1916 until about 1926.

Q. People are still complaining about piston troubles, are they not? A. Not very much. The piston sit-

uation is pretty satisfactory today.

Q. As a matter of fact Ford did change over when he started to put out his V-8, dich't he change over to this particular piston, Exhibit 3-J, didn't he? A. Yes, he did, but that was a much smaller piston than the model A piston, and his V-8 for 1933, I understand, is right back in the direction of the Maynard piston.

Q. And Chrysler in the Plymouth changed over to 3-01 A. That is correct. They have changed over in

the Plymouth to a piston like Exhibit 3-O.

Q. But what I want to bring out, there is a continual change in the piston design even today? A. Oh, yes, there is progress being made. This 3-O piston is an advance in the art of aluminum pistons.

Q. You think it is an advance in the art over the Maynard patent? A. Yes, I do, especially for small

diameter pistons.

Q. Do you think it is an advance in the art over any of the particular illustrations shown in any of the other patents in suit? A. I think it is, yes. It involves combinations which make it very desirable for small di-

ameter pistons, at any rate.

Q. Now, you said that the Aluminum Company submitted various designs to the Franklin Company. What designs did the Aluminum Company or one of its subsidiaries submit to the Franklin Company! A. Well, I don't know just which ones they did submit, but they submitted the Invar strut design eventually, and they were accepted.

Q. But I understand that your statement was that various designs were submitted to the Franklin Company before the Invar strut was accepted? A. Well, I think they were, yes. Automotive engineers of the Aluminum Company were in contact with the Franklin Company at fairly frequent intervals from say 1916 on to the present

time.

Q. They were trying to get pistons, too, weren't

they? A. Yes.

Q. And they tried to take, in a perfectly business sense, away, tried to take that piston business away from Long; isn't that right? A. Oh, no, I don't think so.

Q. But I don't mean in any unfair way; I mean just in the natural course of business, tried to get business.

ness for the Aluminum Company of America. A. They were trying to evolve a piston which was satisfactory both in operation and in cost and in the manufacture, which they finally did.

Q. But you can't tell me what designs were submitted to the Franklin Company? A. No, I can't. But

I suspect that they tested a lot of pistons.

Q. Well, was your statement that a number of designs were submitted to the Franklin Company just based on suspicion, or what was it based on? A. Oh, no, it is based on my contact with the Aluminum Company automotive engineers.

Was submitted, can you? A. No, I cannot. In fact, I couldn't give you the specific design of the Invar strut piston that they used or that they started to use in 1926.

Q. Well, I am not interested in any details you mention. Can you tell me whether the Jardine piston was

ever submitted to them? A. No. I can't.

Q. In other words, after all of your success with the Jardine piston, of the Aluminum Company, you never even submitted it to the Franklin Company! A. I don't know whether it was ever submitted to them.

Q. Can you find out what designs were submitted to the Franklin Company? A. Oh, I think I possibly could,

if there is any point about it.

Q. Well, there must have been a point to it because you stated that various designs had been submitted. A. Yes.

Q. And now you can't tell me what designs had been

submitted! A. That is correct.

Q. Now, turning to the Hives British patent drawing, you placed dividers across that space in Fig. 2 and you found out that the diameter along the wrist pin axis was greater than at right angles to it; is that right? A. Yes, that is right.

.Q. What difference was there? A. Oh, not very much; enough to be readily seen with the sharp point

dividers.

Q. You notice in Fig. 2 very distinctly a center mark, don't you, that had the center of a compass? A.

No, no, there is no centering mark.

Q. What is that part right there? A. That just happens to be some kind of spot. There is nothing like it over here; there is no hole through the paper.

Q. I don't mean a hole through the paper, but I mean there is a spot right about in the center of that circle. A. Yes, there is a spot.

Q. There is a spot! A. Yes, there seems to be another one a good deal like it off to the side a little ways.

Q. But there is no hole through that paper? A.

Q. Now, do you know what process is used in making drawings, of making reproductions like a British patent? A. No.

Q. Well, you know it is a photo-lithographic process,

don't you! A. Well, I don't know what process.

Q. Well, you don't think each one of these was separately drawn up in Great Britain with pen and ink, do you? A. In the printed copies?

Q. Yes. A. Oh, no; these copies are printed, of

course.

Q. Now, assuming this to be a photographic process, Doctor, if the sheet were held perfectly flat and the camera was 100% O.K., you would get a perfect reproduc-

tion! A. Yes.

Q. But if the sheet were held, for instance, concave or convex, that is with the convexity along the vertical line, or the concavity along the vertical line, the reproduction of a perfect circle would show the axis, the horizontal axis larger than the vertical axis, wouldn't it? A. Yes.

Q. And the same might be true, the reverse might be true, if the sheet were concave or convex along a hori-

sontal axis! A. That is correct.

Q. So you wouldn't for one minute say that it was contemplated by the British patentee that the major axis, I mean the axis along the wrist pin bosses, should be greater than the axis at right angles thereto? A. Oh, I wouldn't say that that was necessarily contemplated. I merely pointed it out.

Q. As you read the statement in the specification, page 1, lines 33 to 38, is it your idea that the British patentice contemplated the oval section to be from the line

A.A. Fig. 1, downward! A. That is correct.

Q. That is what you read into it? A. Yes.

Q. That wouldn't make it work, would it! A. No, not very well.

(Short recess taken.)

Q. Now, Doctor, as you read that Hives patent, the oval cross section being from the slot A-A down, the

Q. As far as the relief in the region of the wrist pin bosses? A. I had in my mind this type of relief shown here on Fig. 1; horizontal elotting is shown at the separation between the head and the skirt, and this 1d relief is shown extending out and overlapping the horizontal slotting, and of course that gives the skirt an opportunity to deform.

Q. Well, let's stick a little bit to the relief in the region of the wrist pin bosses, and compare Franquish with Mooers in that. A. That is shown also. The relief is shown by this dotted line 1d, Fig. 2, and the relief overlaps the horizontal slotting, as shown at the upper boundary of the relief, which is in part the lower boundary of the horizontal slot.

Q. Oh, I see. I think I get you. In other words, in the Franquist patent this slotting, horizontal slotting,

does not go into the relief! A. That is correct.

Q. That is your position on that? A. Yes. I may say that the Mooers effect in the 3-0 piston is not as great as it would be in a construction like the Mooers patent, or like the Maynard patent, but the principle of them still operates in the 3-0 construction.

Q. Now, let's get each other clear now. It is your position then, that the Mooers patent distinctly shows the feature of having the horisontal slotting go into the

relief? A. Yes.

Q. There is no question about that? A. Not as I

read the drawing.

Q. And in the Franquist patent the horizontal slotting stops just at the relief? A. Either at or short of the relief.

Q. And in the Ford piston exhibit, Exhibit 3-J, the horizontal slotting does not go into the relief? A. Well, the horizontal slotting goes into the relief very substan-

tially in the Ford 3-J.

Q. But still you don't consider that as having the improvement of the Moors patent? A. No; because of the vertical slot. If that piston were operated without the vertical slot, then the Mooers principle would operate.

Q. But as soon as it has the vertical slot, then the Mooers principle ceases to operate? A. Yes. The forces within the piston then can no longer operate to help distort it to conform to the cylinder. The distortion has to take place, or the flexibility, as the result of cylinder wall pressure. Or if the 3-J piston had the horizontal slot on the other thrust face, then it would, to an extent, have the Mooers operation.

Q. And in 3-0 it is because the slots don't go to the bottom of the skirt that it embodies the improvement of the Mooers patent? A. That is correct.

Q. In other words, extend the slot to the bottom of the skirt and it does not embody the improvement of the

Mooers patent? A. No.

Q. But still you say the other exhibits like BBB and CCC and Exhibit 1 embody the feature of the Mooers patent in there even though the slot does extend to the bottom of the skirt? A. Yes, those all embody the Mooers principle of operation because there is a horizontal separation between the head section and the guide section on one of the thrust faces which is not vertically slotted.

Q. In order to embody the feature of the Mooers patent, it doesn't make any difference how much horizontal separation you have, provided you have some and provided you have that horizontal separation running into a relief; is that your position! A. Oh, my position is that Mooers discloses a principle there which is effective in combination with some of these other features, in helping to reduce clearance in the piston, and when that feature is clearly embodied, then I consider that that is taking advantage of the Mooers principle, and consider Exhibits 1 and BBB and CCC as embodying that principle for the purpose of helping to reduce the overall clearance.

Q. Now, since you have stated your theory, you may be able to answer my question. I sak the reporter to

please read the question.

(Reporter reads question, beginning: "In order to embody the feature of the Mooers patent.")

A. No, as I said, I think it must be enough to do some good. I think I included that in my other answer.

Q. You can't tell me just how much the slot would have to run around or how much it would have to run into the relief; you can't tell me that, can you? A. No, I can't tell you that. I think that when a description like this is given and the principle is disclosed, that it must be enough to do some good.

Q. And you just make the statement it does some good, and that is all you want to give! A. Not only some good; it does enough good for people to pay maney to see it; that is, to put money into construction and ma-

chining to take advantage of it.

Q. Have you tested pistons like Exhibit 3.01 A. No. I have not.

Q. Do you know what its actual construction is? A. C astruction!

Q. Yes. A. I think so.

Q. Do you know whether the skirt tapers from top to bottom? A. I think it does not, but I wouldn't be sure of that

Q. Well, I want to tell you it tapers one and a half thousandths from bottom to top. A. In Exhibit 3-01

Q. Yes. Now, do you know how much clearance there is on the wrist pin axis? A. No.

Q. You haven't measured that? A. No.
Q. Have you any idea how much clearance the should be in a piston of this kind in order to function so as to embody the improvements of the Mooers and Gulick patents? A. Bhough so that when the boss axis wants to expand and pull in the skirt, it is not hindered by pressing against the cylinder wall, with respect to Mooera. I don't think there is any such limitation with respect to Galick.

Q. Now, your position is that because the slot in 3-O doesn't go to the bottom, it functions like Mooers?

A. Yes, in combination with the other features.

Q. And your position is that even though the slot does not go to the bottom, it still functions like Gulick?

A. At the top of the skirt, yes.

Q. Nov, you said you did not test the pistons Exhibits 3.J or 2.Q, or pistons of that construction. Is that true of all of the other account devices here like Exhibits BBB and OCC, that you haven't made any actual tests on thees? A. All the exhibits?
Q. Well, how about BBB and CCC? A. I made no

tests on either BBB or CCC.

Q. Your information, then, is again founded on your experience and what you know of pistons in general; is that right? A. Yes, and what I have seen of Exhibits BBB and OCC, and just the hand flexing tests that I have

given them.

Q. All right. Now taking Exhibits 72 A and 72 B, you said you performed some bath-room tests on that piston. What were they? A. I said I performed some tests on some bath-room scales. I took the skirt part of inton, Exhibit 72-B and put it on the platform of some bath room scales and present downward until the slot closed at the bottom of the skirt. I noted the disl reading, which gave me the number of pounds pressure mary to close the skirt at the bottom with the skirt detached. Then I took another piston of the same kind, except with the head integrally attached to the skirt, a piston in fact like Plaintiffs' Exhibit 1, and stood on the side of it while my little daughter watched for the point when the bottom of the slot was closed. And I found it took practically my full weight to do that, so, taking the ratios of the two forces, my estimate was that the bottom of the skirt in a piston like Exhibit 1 is fifteen times stiffer than the bottom of the skirt when the skirt is detached from the piston.

Q. You knew that without making that test, didn't you? A. No, it was quite a surprise to me, and it was quite a surprise to the automotive engineers that have

been working with these pistons for years.

Q. You mean to say that a head split is easy to close? A: Oh, I knew it would be less, but I had no idea it would be fifteen times, 15 to 1, and that is 15 to 1 in the most flexible part. The ratio becomes steadily higher as the top of the skirt is approached.

Q. You would expect that, wouldn't you? The skirt is attached to the head? A. Oh, yes, I would expect

that.

Q. So that it would be practically immovable at the top? A. I don't know what you mean by "practically immovable."

Q. Well, there is very little movement of the skirt at the top where it is attached to the head? A. Well, there is some, of course, enough to be the difference between success and failure in a piston.

Q. And you assume right along that that action takes place in an engine that you have been talking

about? A. Yes, I know it does.

Q. You know it does! A. Yes.

Q. Now, do you think that is the sort of action that takes place in the cylinder, a pressure along a diameter?

A. That is only one of the many complicated forces.

Q. Well, as a matter of fact there is a diametrical expansion of that piston due to heat along every diameter; that is, at least of the head? A. Yes, that is true. And then the head is very hot, too, as compared with the bottom of the skirt.

Q. And the sides of the piston along the wrist pin bosses are carried out on account of the diametrical expansion along that axis; is that right? A. That is true. There is a force pulling that out, at any rate.

Q. As far as the diametrical expansion of the head along a diameter at right angles to the wrist pin bosses,

that is not applied directly to the skirt? A. No, it is

not: not with the horizontal slota

Q. But the web does expand diametrically, does it not; I mean at least the web does expand with the head, does it not; it is carried out! A. Yes, it has a tendency to do so.

Q. It is carried out along a diameter again, is it

not? A. Yes, it has a tendency to do that.

Q. So that the forces that act inside of an engine are not by any means the simple forces that you have when you simply move Exhibit 72-B by pressing along the lines of the wrist pin bosses! A. No, they are not that simple. I thought I had made that quite clear. And I don't believe that any one has ever made quantitative analysis of the forces in a piston, and if they did so at one temperature or under one set of conditions, they would have an infinite set of conditions different from that one set to take into consideration. So that the forces tending to expand the skirt and expand the head and distort, and so forth, are very complicated. Not only that, the properties of the material change with temperature, even the modulate of elasticity of the material is less at the higher temperature than it is at a lower temperature. So you have a continuing differing stiffness of the metal itself from the head down to the bottom of the skirt. So that all those things combine to make the forces both inside the piston and the forces exerted by the wall against the piston extremely complicated and extremely variable.

Q. You didn't try Exhibit 72-B with a wrist pin

inside, did you! A. No.

Q. That wrist pin doesn't have a slot in it, does it?

A. At the higher temperatures when the flexing is necessary the fit is fairly loose in the wrist pin. In fact, a little too loose to suit the automotive engineers. In order to make the fit proper so that the wrist pin will not seize at sub-zero temperatures, the clearance of the wrist pin is, as I say, quite a bit when the piston is hot, and it is only when the piston is hot that the flexing is needed.

Q. In demonstrating 72-A to the Court, you flexed these little thin skirt parts; you actually flexed them in,

didn't you! A. Yes.

Q. That doesn't really happen unless you have a bump of the cylinder, this flexing in like you demonstrated to the judge, that doesn't happen in the cylinder, does it! A. Why, that would happen as the result of the pressure of the skirt against the cylinder wall, yes.

Q. You want the Court to understand then, where you have a cylindrical wall engaged by a cylindrical skirt, that there is an actual pushing in of these little pieces at the end? A. Yes, I think that is correct. The force is not necessarily the greatest right at the slot to produce that flexing in; the force is extended over the whole of the bearing area.

Q. Over the entire bearing area, isn't that right?

A. Yes. .

Q. And in order to get any movement at all, you have got to get a movement of one cylinder, cylindrical surface, with respect to each other as a whole, don't you?

A. Yes; they will do that,

Q. If there is a bearing all around, the initial movement must be the same at the ends of the cylindrical part as at the center? A. Well, there are other movements going on simultaneously, so that, again, it is an extremely complicated action. It a not a simple lever action.

Q. Now, when you took Exhibit I and you put the micrometers on it and then you fiered it in at the bottom of the skirt, closed that alot or closed it as much as you could with your hands, you got a sort of leverage action on this part that we can call the web, where the wrist pin beauss are; isn't that right? A. Yes, that is

Q. In other words, the turn acts cort of diagonally on that web instead of a straight flexure from along lines parallel with the head of the piston along the webs just below the head? A. Well, I don't know just how it acts. That again, is quite complicated. The uneven section of the skirt and the nature of the skirt between the head and the skirt, all combine to make that a fairly

complex exties.

Q. But you still want the Court to understand that the very small part from the head where the web connects with the head to where it goes into the cylindrical part of the skirt, that is, this corner, that will actually fex in operation, this short little arm? A. You seem to be very small disturbed about the fixing of some particular little spot in the piston. Now I have said that this web is flexible. If is flexible because it is made of a flexible metal; it is flexible because the web is made thin; it is flexible because of all those relationships; and I have demonstrated that it does flex in response to a force which I can apply with one of my hands on the piston, and the

answer that I make is that that portion of Exhibit 1 is flexible enough to function satisfactorily in the motor in combination with the other elements in that piston.

Q. You understand by "that portion," you mean this little part at the top of the slot just about \%" long? A. No, I am not pinning it down to any little part, Mr. Bruninga. I don't see how one can pick out any one little part of this piston and make very much of a calculation about it by itself. Taken in connection with all theother elements of the piston, I have demonstrated, both to my satisfaction, and I hope to the satisfaction of others, that that construction has flexibility at the top of the skirt.

Q. But can't you answer my question when I ask you, do you want the Court to understand that in the operation of the piston the part about 36" of an inch long flexes? A. Yes, I think it does. I think I have said that a good many times. I think I have got very good grounds for saying it, although I don't know that that itself makes a whole lot of difference, because Maynard doesn't necessarily say that that particular part has got to flex; he gives a construction which operates in a motor and the construction is similar to that construction of Exhibit 1.

Q. I agree with you that Maynard in his patent nowhere states that that part is flexible. But I have reference to the Gulick patent, in which flexibility of web is relied upon, and that is what I had in mind when I asked you that question. A. You mean that the web does not extend into the curved portion in Exhibit 1?

Q. That is what you consider, that it extends into

the curved portion? A. Certainly.

Q. Doesn't it extend clean out to the slot, then? A. It may, if one wants to consider it that way; but this

particular part is east in in Exhibit 1.

Q. I understand it then, in Guliek you must consider the web as running from the wrist pin boss clean to the slot 21; is that right? A. No, I wouldn't consider it that way in Guliek.

Q. As a matter of fact in Gulick, when you talk about a web, you are talking about 18 and 17, the connection between the wrist pin boss and the skirt; isn't

that right? A. That is correct.

Q. And that is what I was trying to have you apply to Exhibit 1, that same web. Where do you find it in Exhibits 1, 17 and 181 A. I haven't found in Exhibit I that this curve on the end is carried to the inside of the piston in the casting; it is even put in the cores; and certainly I should say that that is intended to be considered as the total web; that is, up to the point where the cast in portion joins the skirt. But I didn't even the advantage of that curve, which makes for more flexibility in my measurements. I put my measuring surfaces right where Mr. Stellman said that the piston was too stiff.

Q. Let's get down now to cases. We are all agreed, I believe, particularly yourself, that where flexibility is necessary is at the top of the skirt! A. That is where it

is most necessary, yes.

Q. You don't care much about the bottom of the skirt! A. I don't care very much about it in general, no, because that can be gotten easy by itself, but to get flexibility of the bottom of the skirt in combination with the flexibility at the top of the skirt is no small problem.

Q. It was demonstrated to your satisfaction by the fact that the Plymouth gar, as in Exhibit 3-0, that the slot doesn't have to extend to the bottom of the skirt, and that flexibility of the bottom is not important at all t. A. Some means of taking care of expansion at the bottom is desirable, and that means is provided in Exhibit

3-0 in another way.

Q. By the usual matter of relief? A. No, by the unusual practice of oval grinding and also that has to combine with a certain thinness of the piston wall, and it will be found that Exhibit 3-0 has a very thin piston wall at the bottom of the skirt. Those things all have to combine to make Exhibit 3-0 function properly even at the bottom of the skirt.

Q. It was quite a distinct problem to design Exhibit 3-0. then, wasn't it? A. I know it was. Exhibit 3-0

represents 1932 and 1933 engineering.

Q. Quite a departure from anything that preceded it? A. No, not quite a departure, but improves over anything that had preceded it.

Q. Of course, all within the teachings of the Gulick patent? A. Not all, no, but embodying the teachings of

the Gulick patent.

Q. Well, the important thing then is to have the skirt split at the top; that is the important thing, isn't it?

A. That is important, yes. All of these infringing devices here have skirts split at the top in combination

with a horizontal separation between the head portion and the skirt portion, and that is important to get flexi-

bility at the top of the skirt.

Q. And you mean the accused infringing devices. Now, in the Gulick patent, splitting of the skirt is supplemented by flexible webs, that splitting of the skirt at the top is supplemented by flexible webs 17 and 18? A. In the Gulick drawing, yes.

Q. When you talk about flexible webs, you must have reference to flexibility of the web at the top! A. Flexibility of the web so that it will permit flexing at the top of the skirt, so that it will permit flexing of the skirt at

the top, yes.

Q. And that is what you must have had in mind when you considered Exhibit I; isn't that right, flexibility of the web at the top? A. Flexibility so that the skirt at the top can flex. It should be obvious that the flexing of the web in Exhibit 1 at points below the horizontal separation will help the flexing at the top of the skirt. Again, showing the complicated nature of the forces.

Q. Now, you found a flexing there of what we will call the web at the top, of in the neighborhood of six thousandths of an inch! A. That amount of flexing is more, I think, than it really did flex. I think the real amount of flexing was more like two or three thousandths.

Q. Then in your opinion a flexing of two or three thousandths of an inch of a structure like Exhibit 1 is sufficient to meet the conditions? A. Oh, yes, that would be ample.

Q. You are sure of that, that the flexing of that amount, two or three thousandths, is enough? A. In

this piston Exhibit 1, yes; I am certain of that.

Q. And that is only one slot? A. That is correct. That has other means, however, of compensating for clearance.

Q. If you had four slots, you would only need one fourth that much flexing at four different places? A.

Not necessarily.

Q. Well, let's go back to the Franquist patent. Your position is that that skirt is absolutely inflexible, isn't it? A. Oh, no; I said that skirt simulated a trunk type skirt piston. I can't say it is absolutely inflexible, but it is rigid.

Q. Now, the tests you previously performed on it was a diametrical contraction test; isn't that right? A.

Yes.

Q. And you performed the same tests on an ordinary trunk type piston: isn't that right? A. Yes.

Q. You would expect those results, wouldn't you?

A. No. I didn't: I was very much surprised.

Q. Didn't you know that when you take any hoop, whether split or not, and you start to contract it diametrically, that it doesn't make much difference how many protuberances there are around there on the inside or outside, that it is the weakest part that yields? A. Well, I may not know as much about hoops as I should, but I was surprised to find that that Franquist skirt behaved like a trunk type skirt. I was surprised that I did not observe the flexibility of the skirt that the Franquist patent says there should be.

Q. Now, taking for instance, comparing pistons Exhibits 3-H and 3-Q, you actually found that as far as pressure applied at diametrically opposite points I am just taking these for illustration just taking 3-H for illustration pressure applied at diametrically opposite points caused about the same pressure in these two types! A. Yes, that is correct. The Franquist type, I

think, even was a little stiffer.

Q. You would expect that on account of the corrugations? A. Well, I didn't expect it, but it was true.

Q. But you did not apply a circumferential contraction test, for instance, with a pair of clamps like this Exhibit 34; you didn't apply a test like that? A. No, I didn't.

Q. That is nearer to the actual conditions that are encountered in automobile practice than a simple diametrical pressure; isn't that right! A. No, I wouldn't say that it was. It would be in the piston that had a circular cross-section, perhaps.

Q. But take a piston like Exhibit 3-H and applying this clamping device to it, you wouldn't expect me to be able to compress that at all, would you, with my hands?

A. No. I would not.

Q. You would not expect that at all, would you! A. No, I would not."

Q. Would you expect me to be able to contract 3-Q?
I should think so, some.

A. I should think so.

Q. You would think out A. Yes.

Q. Now, what is the difference, and what happens? A. The difference is that you have the tremendous pressure put on circumferentially and you get a little flexing in these ribs.

Q. And these slots actually close up a little? A. I

should think they would, a little bit.

Q. And when they actually close up a little bit, that means that the circumference of the whole piston has decreased! A. Yes, I should think so, a little bit.

Q. You have never tried it with 3-Q1 A. No.

Q. Now, it is your opinion that it doesn't make much difference whether you expand these ribs inwardly or not and increase the length of the slot, that, if anything, will make the piston stiffer! A. Yes, I rather think so; it will be stiffer at least against diametral distortion.

Q. Even as to the closing up of these slots by applying a clamping device to it! A. I don't know how that would affect it; it might make it a little more perceptible, circumferentially.

Q. Well, you haven't tried that out, have you, Doc-

tor! A. No. I haven't tried it.

Q. I want to hand you a piston marked for identification Defendants' Exhibit 5-L. Examine that with reference to 5.Q. Those two constructions look about the same except that the internal ribbing has been increased. don't they! A. Yes.

Q. And except that the wrist pin has been left out of

5-Lif A. Yes.

Q. Now, Doctor, I want you to watch me perform a few little experiments. I am going to take a half a dollar and insert it in one of these slots. (Counsel does so.) Now, that is loose at this time, isn't it? Now, put it in first, the Master put it in loose. (Half dollar is put in and Mr. Brunings applies pressure with clamping device.) You find that tight, don't you! (Referring to half dollar being held in slot.) A. I find evidence of a little flexing, yes,

Q. But that means I have actually contracted that piston circumferentially; isn't that right? A. I suspect so, although I would like to get the measurements all around to make certain of that. And the pressure that you have need is, I would say, twenty times what would be allowable in a motor to produce such a result. You have used a tremendous leverage to get that result.

Q. I suppose that in your demonstration of Exhibit 1, you didn't use a leverage that was much in excess of that used in a motor? A. I don't know what leverage might be obtained in a motor, but I only used the forces that I possess in my right hand, just one hand.

Q. Don't you think with that leverage that you used at the bottom of the slot in Exhibit 1, that that was multiplied say from twenty to fifty times at the bottom? A. Oh, it would multiply some, certainly; but I don't know how much and I don't know how to arrive at any figure to show how much it is, but I would not expect you to be able to flex this piston, Exhibit 5-L, with your hand enough to either see or to tighten a half dollar when put in one of the grooves.

Q. Now, I am going to try each one of the other slots in succession. (Counsel does so, putting half dollar in each of four slots at bottom and then at top of the skirt and applying clamping device after each insertion.) A. I should like to put the micrometers across a section

while it is being flexed.

(It was thereupon found that the proper size of micrometer was not available for the piston in mestion.)

Q. Well, Doctor, just try a scale across here. This is graduated in 64ths of an inch. See if there is a movement there.

(Applying clamping pressure with clamping device.)

The Master: I thought it was visible.

Mr. Bruninga: I will try it along the lines of the wrist pin bosses now. (Counsel does so.)

The Witness: What is needed is two simultaneous diameter measurements; that is, to see whether or not the pressing in on one diameter may not correspond to an expansion in the other diameter. It may even do so on a piston like Exhibit 3-H. although I can see none on Exhibit 3-H. It is not possible for me to see any movement with a scale on Exhibit 5-L.

Q. But now I have the clamp on the piston again, and I want you to tell me whether you cannot see a distinct movement, slot-closing movement of one of these slots, which is the one having a little nick, the single nick, right near the point where the entrance comes from the outside diameter? A. Yes, I can see a little movement there with the eye.

Q. Now, any closing of that slot like was demonstrated by putting coins in those slots, means that there was a circumferential contraction, wasn't there? A. Not

necessarily.

Q. Oh, how could a slot in there close, Doctor, without decreasing the circumference? A. There may be an increase in diameter in a direction at right angles to the

two supporting ends of the clamping device.

Q. Now, you have previously stated that two thousandths of an inch is sufficient for practical purposes in Exhibit 1, a deflection of two thousandths. A. In combination with the various other elements in Exhibit 1, and if it does not take too much force to produce that two thousandths of an inch deflection. Of course if it should take enough force to make the piston press too tightly against the walls or to score or to rub so that the power would be lessened, then the piston would not function properly.

Q. Now, two thousandths is the thickness of a rather

small hair! A, Yes, the average hair.

Q. You can't even see a movement of two thousandths of an inch, can you, with the naked eye? A. I think not.

Q. Would you still think that the Franquist patent piston, the piston disclosed in the Franquist patent 1,152,-902 is just plain no good? A. Yes, yes, I still think that.

Q. And you still think that the piston would seize in a cylinder if constructed like Exhibit 5-L. I mean with the ribs just simply expanded inwardly—I don't want to tie you down to any specific construction—and with reliefs in the region of the wrist pin bosses? A. It would either rub too hard against the cylinder wall or it would slap, one of the two; that is my opinion.

Q. You have never taken the trouble to take a set of these Franquist pistons and put them in an engine to determine whether they would actually work? A. I have

not, no.

Q. And that is in spite of the fact that a number of suits were pending on that patent? A. Well, I didn't know about that.

Q. Well, you knew at least one, the Simmons suit was pending? A. Well, I made other tests at that time.

Q. But these theoretical tests that you made in a testing machine of simply pressing that Franquist piston diametrically, which I take it was a piston like Exhibit 71-B, satisfied you thoroughly as to its impracticability? A. Why, it satisfied me that it was too stiff to operate properly and to operate the way the patent said it should operate, and I think that the fact that you have come in here with a piston that has grooves some twice as deep as in the drawing shown in the patented construction, is

pretty good evidence that my conclusions were correct there. Furthermore I said it didn't operate like the patents in suit, anyway. It is supposed to operate according to a kind of accordion principle rather than the simple flexing principle of Gulick and the other flexible

skirt patents in suit.

Q. You don't see any particular departure between that Exhibit 5-L and the Franquist patent by the mere fact that the depth of those ribs is increased? A. Well, it is a departure from the drawing of the patent and it is a departure from the piston that you brought in here as representative of the patent, and it is different from the standpoint of construction, in that the construction which you brought in last would be a more difficult one to make, to make it economically.

Q. But when you found out that a structure like 71-B did not show up good, you quit right there, didn't you? A. When I found out how stiff the skirt really was, when I found out it wouldn't flex practically, I was

Q. And you didn't proceed any further to lengthen out those or rather deepen out those slotted ribs to see whether you could make it work that way! A. No, we had no infringing devices with those features on.

Q. You didn't have any infringing devices for the

simple reason that the patent was about to expire; isn't that right? A. No, if that were a good patent, every-body would be making the pistons now except the licensess of the Cleviland Trust Company, perhaps.

Q. But you didn't look at that patent and read it and re-read it with a view of trying to make that piston operative to suit you, did you! A. Yes. During the time I went over that patent I tried to find all the good in it I could. I was very much disappointed.

Q. And you were consulted before any suit was brought on that patent? A. No.

Q. Against the Simmons Company! A. No. I wasn't consulted before any suit was brought on that patent.

Q. That was the first time you ever looked at that patent after the suit had been brought? A. Yes, it was.

(Short recess taken.)

Q. Of course, your position is, Doctor, that if one side of Righthit Q, that is, if one of the slots was completely out through here, then the thing would not work at all; isn't that right, if one of the vertical slots was

cut clear in two? A. Well, if wouldn't work at all, well, no; you would have all the real cylinder wall pressure on the solid part of the skirt right adjacent to the slot, and the thrust face then would be quite flexible.

Q. Flexing that lever arm from one side of the horizontal slot to the other? A. That would not be a

good construction.

Q. You remember the Hartog patent that we had up on prima facie, that had a construction along that line?

A. Oh, not like that, no.

Q. No; but I mean that the skirt was divided to one side of the piston and there was just simply one segment that moves in and out! A. Yes, a long spring, very flexible arrangement.

Q. You didn't consider that good at all? A. No.

Q. You know of course that Mr. Hartog was in in-terference with Mr. Gulick in the Patent Office—the record shows that? A. Well, I have just heard of the

Hartog-Gulick interference, that is all.

Q. You don't know whether any objection was made by the owner of the Gulick patent that the Hartog structure was imperative and therefore the interference should be dissolved entirely? A. I don't know anything about that.

Q. Now, you made the statement that hundreds of thousands of pistons were made as illustrated in the Maynard patent and without the relief, which is so plainly evident in Exhibit 1 where the sylindrical surface joins the so-called webs—that is what you meant? A. Yes.

Q. That it didn't have those reliefs on it? A. That

is right.

Q. And when you said "bundreds of thousands" what did you base your information on? A. On records that I looked at in connection with the Oakland piston and the Maxwell piston.

Q. Did you see any of these pistons installed in any

engines! A. No.

Q. You don't know, then, whether they might have filed off or dressed off the parts corresponding to the reliefs in Exhibit I? A. I den't know exactly. I don't think it would make any difference whether they did or

Q. Lam not asking you whether it would make any difference. But you don't actually know whether those pistons went into those cylinders in that shape? A. I didn't see them. I saw the drawings, which did not call for any special clearance at that point.

Q. I am again asking you what you know; not what

you saw from a drawing. A. I don't know.

Q. You don't actually know whether any of those pistons ran for a hundred miles without the relief? A. Oh, I didn't follow up the tests; but I know it and people know things even that they haven't exactly seen.

Q. But I am asking you now what you know, from a legal standpoint; because the law of evidence, unfortunately being against your views, requires knowledge rather than suspicion or founded upon what somebody else told you.

Mr. Richey: Well, that is not a correct statement of the law under the circumstances.

Q. You don't know now whether any of those pistons were ever used in any engine for any length of time, say a thousand or two thousand miles, without having some sort of relief put in them? A. From the standpoint of actually seeing the pistons and going in the motors and measuring them, and tearing down the motors and looking at them, that is correct.

Q. There is not a single one piston today of the type of Exhibit I but what has that relief? A. If you want to call it relief. I think the pistons today all have a smaller bearing surface in some way at the top of the skirt than would be indicated by merely bringing the web

out straight.

Q. I believe you said that the Ford Motor Company is not now using pistons like Exhibit 3-J, but more along

the lines of Exhibit 11 A. That is correct.

Q. As a matter of fact, in that Ford piston as used today that relief goes almost to a point, doesn't it? A. Yes; not almost to a point, but it goes not very much farther than is in Exhibit 1. That is the bending of the web in there, or relief, or whatever you want to call it; the web is actually east in there, however.

Q. Well, the relief is just about along the lines of the pencil mark, isn't it; it is about that much in the new Ford piston? A. Yes. The pencil mark is pretty wide. It is more like the pencilling that is now heavily made.

Q. In other words, the top of the relief would be around 5/16" from the vertical slot, around about that?

A. I should say so.

Q. That is the way the pencil mark shows? A. I should say so. That applies, as far as I know, only to the new 8.

Q. To the small piston! A. To the small piston,

Q. And that is true on each of the thrust faces? A. Yes, it is, and the piston is slotted on both sides horizontally and it is not cam-ground any more.

Q. Have you a sample of that piston? A. No, I

haven't.

Q. Where did you see it? A. At the Aluminum Company plant.

Mr. Bruninga: Since the witness has talked

about it, can't counsel produce one?

Mr. Richey: I don't know whether I can or not. I haven't one.

Mr. McCoy: I never saw one before.

Mr. Bruninga: The witness brought it in; I didn't bring it in.

The Witness: Well, it is immaterial, isn't it? Mr. Bruninga: I don't know whether it is or not. This matter of relief has come up. I believe it is incumbent upon counsel to produce such a piston as can be readily obtained around town.

The Witness: I don't know what you want to

do that for.

Mr. Bruninga: You mean-

The Witness: Well, you are just extending this

Mr. Bruninga: Are you talking as counsel? The Witness: Off the record.

Mr. Bruninga: No, let it go on the record.

The Witness: I have four or five things I have been trying to get out now for ten days, and other people are trying to get me to go over to different places to do things, and I certainly should like to get through with this thing.

Mr. Richey: Of course, if I had the piston and it is material, I would produce it; but I haven't the piston. If the Master holds it is material and should be brought in, and the witness will bring it, that is satisfactory to me. But the record shows this whole thing about the relief you are talking about is immaterial.

The Master: I don't know now whether it is or not. If the other side wants to produce it, very well; I don't see why it should be ordered to be produced; that is up to the parties.

Mr. Bichey: I have no objection to the witness producing it; I haven't got it. Of course nobody here has any authority, not even the court, to require the witness to produce a thing.

The Master: I didn't say that.

Mr. Richey: I beg pardon; I didn't mean that. But your Honor probably knows what the rule is and has seen it invoked in other cases of this kind.

Mr. Bruninga: I am going to leave it up to you. If you want to produce it, all right; if not, I move that all the testimony with reference to what Ford is doing now, be stricken out.

Mr. Richey: What part is that?

Mr. Bruninga: All reference to what Ford is now using as distinguished from Exhibit 3-J.

Mr. Richey: What part of the answer? Mr. Bruninga: On direct and cross, both.

Mr. Richey: What is it you want striken out?
Mr. Bruninga: If it is so immaterial, I ask
that it be done. You know well enough what you
are going to do; you are going to tell the court later
on that Ford changed over after trying something
else.

Mr. Richey: All right, we join in the request that the witness produce this piston. Of course he can do what he wants to.

Mr. Bruninga: 'If the witness doesn't produce it after recess,' I am going to move that reference to that Ford piston be stricken out, particularly since it is immaterial.

The Witness: I will get the piston. If there is anything else you want, I wish you would mention it now.

The Master: Anything further?

Mr. Bruninga: No.

(Thereupon adjournment was taken to 1:30 p.m. of the same day.)

(Thereupon at 1:30 p.m., Thursday, March 23, 1933 the trial was resumed.)

Ra-Dissor Examination by Mr. Richey.

Q. Can you produce the piston that Mr. Bruninga asked for just before lunch, and if so will you do so?

A. I produce the piston asked for.

Mr. Richey: I offer it in evidence as Plaintiffs' Exhibit 76.

Mr. Bruninga: Of course I want to save my objection until I find out what the witness knows about this piston.

Q. You have been asked during your cross examination a lot about the alleged relief at the ends of the webs in Plaintiffs' Exhibit 1. Will you state whether or not that is a relief or an extension of the web and give your reasons for your answer? A. I would consider the portion of the skirt in Plaintiffs' Exhibit 1 near and at the top of the piston on which evidence of grinding is present, to be the skirt portion proper, and the remainder of the top portion of the piston below the head section, to consist of webs. These portions are east into the piston and have counterparts of the depression on the outside of the piston wall in projections in the inside of the piston wall. It appears to me that the webs may be considered as the parts extending up to the portion of the outer wall of the piston which has been machined.

Q. How long has the Aluminum Company of America marketed pistons like that Plaintiffs' Exhibit 11 A.

With the bent-in webs, do you mean?

Q. Yes. A. II couldn't say exactly, but I should say with that construction or its equivalent since, say, 1923 or 1924.

Q. Do you know whether or not that same kind of piston has been marketed and sold by any other licensees of the Cleveland Trust Company! A. Yes.

Q. Which others? A The Bohn Aluminum &

Brass Company.

O. Any others to your knowledge? A. Also the Aluminum Industries, which I understand is a licensee

of the Aluminum Company of America.

Q. Now, will you state whether or not any or all of these licensees were making that kind of piston before the Sterling Products Corporation began the manufacture of it, if you know?

Mr. Bruning: That is immaterial, your Honor.
The Sterling Products Company is not involved here
at the present time. If you restrict it to the parties—

The Master: What do you claim for that ques-

Mr. Richey: Well, we claim that the manufacture of these pistons duplicated the commercial piston of the licensess of The Cleveland Trust Company, followed in their footsteps. Mr. Bruninga: In addition, I believe it should be brought out that that witness knows about this, not just guessing.

The Master: I think he may answer and you

may have your exception.

A. The Bohn Aluminum & Brass Corporation was, to the best of my knowledge. I don't recall of seeing the particular pistons manufactured by Aluminum Industries of this particular type.

Q. What about the Aluminum Company of America?

A. Oh, the Aluminum Company of America was, to the

best of my knowledge.

Q. Now, you were asked about the flexion of these webs, particularly with respect to length and thickness of web. Will you state what if any relation there is between flexion and thickness, and also between flexion and length? A. Yes, the other variables being the same, the flexibility of a web would be directly proportional to its length. But the relationship between the thickness of web and flexibility is not a direct proportion; that relationship varies as to cube of the thickness. That is, if a web is doubled in thickness, it will be eight times as stiff; and if it is halved in thickness, it will be only one eighth as stiff.

Q. You were asked about your knowledge of manufacture of and use of pistons like those shown in the Maynard patent with straight webs or without what Mr. Brunings has called "relief" at the ends of the webs. Will you state whether or not you have yourself seen any commercial pistons of the Maynard type without

that so-called relief? A. I have.

Q. And where and to what extent? A. I have seen many of those pistons in the laboratories of the Aluminum Company and in the Aluminum Company plant.

Q. Under what conditions did you see them in the plant? A. I have seen the pistons before they have been put in the motors and I have seen them after they have been put in motors and taken out again.

Q. Now, in this stand business, the car or engine manufacturer furnishes the drawings to the Aluminum Company, for example, or whoever makes the piston casting, don't they? A. Yes.

Q. That is the practice, is it? A. Yes, either that or they accept a drawing proposed by the Aluminum

Company.

Q. And that drawing being furnished to the manufacturer of the castings, what does the manufacturer of the casting do? A. He designs a piston casting in such a way that when it is machined, it will correspond with the customer's approved drawing.

Q. And what is the custom as to manufacturing or machining the castings with respect to the drawing? A. The custom is to machine the casting to the drawing.

Q. And if there are any changes made in the casting that are not shown in the drawing, what is the custom! A. The custom is to incorporate the change in the drawing.

Q. And then what was done with respect to the manufacture of future castings? A. The future castings would correspond with the changed drawing until

some other change is incorporated.

Q. I have concluded as the result of the questions that were asked that our adversary might contend that some of these corners at the ends of the webs in some of these pistons you said were made after the Maynard patent might be filed off. Would you state whether or not it would be feasible to to that, particularly in such large quantities as you said those pistons had been made and used? A. No, that would be very improbable in a manufacturer's plant.

Q. Why would it be improbable? A. Because it would be necessary, to reduce the cost of machining the pistons, to make the operation standard and incorporate it in the construction, rather than endure the extra cost

of hand-filing of any part of the piston.

Q. During your cross examination you were shown this model 5-L. Franquist type of piston, Defendants' Exhibit 5-L. Would you compare that in construction, mode of operation, and results, with the pistons of the patents in suit!

Mr. Bruninga: I forgot to offer in evidence that particular piston, Defendants' Exhibit 5-L. I now offer it in evidence.

The Master: It may be received.

A. My comparison would be substantially the name as the comparison with the previous Franquist piston, Defendants' Exhibit 3-Q. The discussion with reference to the locking of the steel wrist pin, for example, with the set screws and the relationship of the grooves and the horizontal slots, would apply to Exhibit 5-L the same

as to Exhibit 3-Q. The piston does not embody the Schmiedeknecht construction, and I do not believe it could operate like the Mooers patent in suit. The relief mentioned in the Franquist patent specifies that the section which is to be relieved, is the portion around the bosses indicated, I think, as 14 in the Pranquist patent. This would mean that the relief would stop suddenly at the tops of the vertical grooves on either side of the bosses, and consequently, there would not be the opportunity for the piston to function like the Mooers patent, even if the wrist pin were not looked tightly by set screws in the bosses. The construction is not like any of the other three patents in suit involving flexible skirts, because the other patents all combine horizontal and vertical slotting of the piston skirt to enable the skirt section to flex in response to cylinder wall pressures. The mode of operation of the Franquist piston is also different from that of the Berible skirt putests in suit.

Q. You mean Exhibit 5-L7 A. Yes, 5-L. And the result would be different.

Q. You spoke on cross examination about it was not so much the matter of getting this two thousandths contraction but how it was gotten. Will you explain more in detail what you mean by that? A. I said that I thought two thousandths of an inch flexing in the web of Exhibit 1 at the top would be ample to allow that piston to function. That two thousandths of an inch, however, is not on the whole diameter of the piston, but it is on only a portion of the diameter. That makes two thousandths of an inch more potent in compensating for extra expansion than two thousandths of an inch on the whole diameter of the piston. Furthermore, such flexing as there is of the webs at the top in Exhibit 1, co-operates with relief and flexibility of the skirt and possibility of distortion as the result of cylinder wall pressures on the slotted sides, and the Mooers principle on the unelotted side, to compensate for the extra expansion of piston Exhibit 1. So that the entire compensation does not have to be taken care of by web flexing in Exhibit 1.

Q. State whether or not there is any importance as between the relation of the yielding of the piston and the pressure at which it yields? A. Oh, that is all-important; that is, the compensation for extra expansion as the result of cylinder wall pressure must be gained with mederate wall pressures or the whole object of the piston is defeated. If the wall pressure necessary to produce

the flexing is too great, the power is reduced as a result of this excessive wall pressure or the piston may score or seize or the cylinder may score. It is eccential that the compensation for extra expansion be provided by moderate cylinder wall pressures in order to gain the advantages of the flexible skirt piston.

Q. In other words, the yielding may come too late?

A. Yes, it may.

Q. Now, look at these so-called Franquist types of pistons 5 L and 3 Q and the others and compare their point of yielding with that which is necessary to prevent scoring. A. Well, as near as I can judge from all that I have seen and the tests that I have made, the amount of pressure required to produce any substantial or helpful amount of yielding in the skirts of pistons 3-Q and 5-L, would be too great for practical purposes; that is, the piston would bear too hard against the cylinder walls to give a practical result.

Q. Speaking of seoring in this connection, will you look at this Ricardo type piston Exhibit 73, and state what caused the irregularities on one side of one of the slippers? A. Yes, that is a typical case of scoring. That piston opposite the end of one of the webs has been bearing very hard against the cylinder wall. In fact, that degree of scoring would very greatly reduce the power obtainable from a piston operating in a cylinder, and the

condition would be unbearable in service.

Q. If the web continued to expand, what would

happen? A. The scoring would be still worse.

Q. Up to the point where it would seize? A. Yes.

Q. As shown, it has been so great as to press the metal over into the relieved part, hasn't it? A. Yea; it has exerted a force greater than the elastic limit or yield point of the metal itself.

(Short recess taken.)

Q. Will you next look at the Schoengarth special piston Exhibit 5-K10 and compare that in structure, mode of operation and results, with the piston of the Guliek patent?

(Addressing Mr. Bruninga.) You are only relying

on that against Guliek, wren't you'l

Mr. Bruninga: Yes.

A. This piston, Defendants' Exhibit 5-K10 has a construction and devices designed to make the skirt section adjustable. It is a rigid construction when ready

to operate, being not substantially different from a trunk type piston. The skirt is designed to be fixed in diameter when the piston is cold and to retain the same relationship between the various parts of the piston as a trunk type piston would when heated. The piston being . so constructed, its construction is different from that of Gulick, its mode of operation is not different from the mode of operation of the trunk type piston, whereas the mode of operation of Gulick is one in which the skirt is flexible and is destined to flex during the operation of the piston itself. Because of those features, the mode of operation of Defendants' Exhibit 5-K10 is different from that of Gulick, because also of the differences in construction, and mode of operation, the result of Defendants' Exhibit 5-K10 is different from that of Gulick. It is true that in securing the adjustable feature there is a horizontal separation between the head section and the guide section, and there is a vertical slot in one of the thrust faces connecting the horizontal separation with the bottom of the skirt. These features of the construction, however, do not co-operate with other features in the piston during the operation of the piston. Such flexibility of the skirt as is obtained by the slotting alone, is used only in the first installation of the piston, and then at any future interval in which an adjustment is desired. The skirt is only flexed, therefore, at one or relatively few intervals in its whole lifetime, and the flexing does not co-operate with the other parts, of the poston while the piston is in operation in the motor. So far as operation in the motor is concerned, therefore, Defendants' Exhibit 5-K10 might be just as well a trunk type, non-flexible skirt piston.

Q. Would the motor be running when the adjust-

ments are operated there? A. No.

The Master: This one is manually flexible. The other one is automatically flexible?

Mr. Richey: Yes, that is one way of expressing it, of course for entirely different purposes.

Q. You were asked to remeasure one of the parts of the Monekmeier cast iron piston and make a correction on Exhibit 74, which you did! A. Yes, sir.

Q. This correction was in the amount of one thousandth of an inch. Will you state whether or not that change in dimension would change in any way any of the opinions you have given with respect to the Monokmeier piston or any of the other testimony you have

given with respect to it, except that difference of a thousandth of an inch? A. That difference, by the way, was ten thousandths of an inch.

Mr. Brunings: I didn't stress that; I just wanted to have these figures appear correct; that is all.

I didn't make any point of that at all.

A. The change in the measurement which represents a correction over my previous measurements, does not change my testimony, with one exception: I believe that when the piston, Exhibit 3-V, was new, the top of the guide section would be represented approximately by the lands on either side of the upper narrow ring groove. It is clear, however, from the corrected measurements, that during the later stages of speration of this piston, the whole head has been functioning as part of the guide section; therefore in the later stages of operation of this piston, the guide section has extended to the very top of the head. So the conditions were really worse than I had concluded from my earlier measurements.

had concluded from my carlier measurements.

Q. This piston, Defendants' Exhibit FFF bears the initials "W. M. L. Co." and the name "Magnalite." Do you know what company that was that had those initials and used that name? A. Yes, that is the Walker

M. Levett Company.

Q. So it was the Walker M. Levett Company and the Aluminum Company of America that sold these socalled Long type pistons to Franklin and not Long? A. Yes, that is true with respect to the permanent mold pis-

tons, at any rate.

Q. Now, during your examination you have spoken of the combination of the elements and the co-operation of the elements in these pistons. I wish you would explain what you mean by that. Take, for example, the piston shown in the Maynard patent and that shown in Exhibit 1. A. I had in mind that the various features of the construction of the piston like Exhibit 1 co-operate with one another, all at the same time, to help to produce the beneficial results, that is, with the horizontal slot, the vertical slot, the webs, the difference in diameter between the head and the skirt, may all be operating at the same instant in the piston and each may be modified by the other or at least one may be modified by others in the operation of the piston.

Q. You say "they may be." Will you state whether or not they do as a fact co-operate together? A. Yes,

they do.

Q. Where did you get this piston you produced here, Exhibit 761 A. From the piston plant of the Aluminum Company of America at Harvard Avenue, Cleveland.

Q. State whether you know that is a Ford piston, and if so, how do you know it! A. It has the name "Ford" cast on one of the webs. I don't know from first hand information by being at the Ford plant or from any correspondence or visits that I have had with the Ford Company that this is their piston for the 1933 V-8, but this is the piston that is being manufactured for Ford, at least the castings for such pistons are being manufactured for Ford at Harvard Avenue, and I have every reason to believe that that is the piston which Ford is now using in the 1933 V-8 engine.

Q. Well, that has the Ford trade name on there,

hasn't it! A. Yes, it has.

Q. How long has the Aluminum Company been making pistons like that for Ford! A. Only two or three months, to the best of my knowledge.

Q. Was that before or since they made pistons for

Ford like Ekhibit 3-J1 A. That is since.

Mr. Richey: That is all.

RE-Choss Examination by Mr. Bruninga.

Q. You don't actually know that Ford has adopted that piston Exhibit 76, in production? A. Yes, I know it, practically. I know that the Aluminum Company is making pistons like these by the thousands now.

Q. I am asking you though, now, do you know whether Ford has actually adopted that equipment as standard equipment? A. I haven't seen one put into the engine block, or anything of that sort, no, but the way I gather other information of that sort about the automotive industry, I am practically certain that Exhibit 76 is the 1933 Ford V-8 piston.

Q. But you don't know but what Ford is still experimenting with that piston to determine whether it is going to be the standard piston! A. Yes, he is putting them into the cars that he is selling now; I feel pretty

certain of that.

Q. You just know that from hearsay! A. If you

want to call it that.

Q. We are just asking for your information and not deductions you might draw from what people tell you or what you see. Now you said that the flexibility varied directly as the length, in other words, if the length of

a part is increased to double the length, it would be double the flexibility? A. That depends on what you mean by the length. If it is the length of the web, then you halve the flexibility, other things being the same. If it is the length of the lever arm, then the flexibility is doubled.

Q. And that varies universally as the cube of the thickness, is that your understanding of the theory of

mechanics? A. Yes.

Q. That only applies, however, to a simple beam fastened to one end; isn't that right? A. Oh, that applies to beam structures generally that are solid.

Q. That doesn't apply to a complex structure like the web in Exhibit 1, does it? A. Oh, not exactly; that

12 122

is very complicated, of course.

Q. Now, you said you have seen pistons like Exhibit 1 without that relief that we have been talking about that is the relief in the cylindrical part going from the web to the skirt proper. Did you see those pistons after they had run for a while? A. Yes, I have,

Q. And you found out they were down on these corners! A. That was the point of hardest bearing,

yes.

Q. And after a while they were down considerably?

A. Yes, they could wear quite a bit. Of course any piston wears as it is used in the motor.

Q. But that was the point of greatest wear, the some

of greatest wear? A. Yes.

Q. And there was considerable pressure applied there, wasn't there, to cause that scuffing off or wear, we might say! A. Well, the piston will wear whether it has any pressure other than the thrust pressures. I don't know of any way to keep a piston from wearing in service.

Q. Yes; but that wear that takes place in those regions we are talking about, that was due to considerable pressure applied in those regions? A. Oh, I don't know as you could say "considerable pressure." It shows that the piston was bearing first and eventually hardest at

those points.

Q. And that is the reason that the Ford piston, Exhibit 3-J. B cameground to avoid that wearing down, initial wearing down? A. Well, not exactly. The camegrinding there is done to try to obtain more even bearing pressure against the sylinder wall at all times, and so that the piston can be fitted a little closer when now.

Q. Now, you take then, as the length of the web, the distance where the web part of Exhibit 1 at the top



actually joins the head at the top to the cylindrical part of the skirt; isn't that right—you take that as the length of the web! A. I take that as the length of the flexible portion of the web.

Q. Flexible portion of the web? A. Yes.

Q. That is what you take? A. Yes.

Q. Then, I suppose, in Exhibit 76 you would take it again as way up to almost the slot! A. Yes, that web is cast in also in Exhibit 76.

Q. And that is what you consider the length of the web to be, way up into the skirt part! A. That is the length of the flexible portion of the web at its top, yes, I should may so.

Q. But in the Gulick patent you only take the length of the web as the part 17 on the skirt? A. Oh. I should think so; that seems to be the only place for the web to end there in that casting.

Q. Now, as far as the part on the inside of Exhibit 1, which shows a set off corresponding to that keystone relief, that is really done for the purpose of having thickness of the metal the same in the casting, isn't it? A. Well, not necessarily for that purpose. That corresponds to the relief in the outside of the casting.

Q. That is common practice in stove molding, isn't it, where you have an ornamental part on the stove, to fix up the pattern so that the ornamental side is relieved at the back! A. I don't know.

Q. You have never seen a stove casting? A. Well,

I don't know that much about stove-molding.

Q. Well, from your knowledge of metallurgy and easting, you would consider, if there was such a relief, it was done to keep the thickness of the metal the same? A. Well, not necessarily to keep it the same; I would sav it is probably designed to provide the proper relationship between flexibility and the other features in the piston, with a horizontal slot of a certain kind.

Q. Now, when you talk about wall pressure between a piston and a cylinder, you really mean the pressure per square inch, which is usually expressed in pounds per square inch? A. I don't know how it is expressed. I mean the pressure of the piston as it expands out against the cylinder wall or as it is forced against the cylinder wall.

Q. But in an engine where the piston expands and there is wall pressure, there may be moderate wall pressure on a unit of surface and still be considerable pressure against the whole surface; isn't that right? A.

Well, that depends of course on the bearing area. If you had a very large area of bearing, you could have small unit pressure and fairly large total pressure. Again that is assuming that the pressure is pretty evenly distributed over the whole surface.

Q. Do you know what the permissible pressure per square inch between a cylinder and a piston without causing scuffing off, undue wearing down, is? A. No.

Q. Now, in the Long piston, Exhibit F, you found evidences of wearing off the skirt, didn't you? A. Yes.

Q. And you don't have reason to believe that that piston seized? A. No, I think probably that piston did not seize.

Q. That Ricardo piston, Exhibit 73, is a sand-cast

piston, as you know, don't you! A. Yes.

Q. And being a sand east piston, that aluminum was rather soft, wasn't it? A. Probably softer than the

permanent mold piston.

Q. Quite a lot softer than the permanent mold? A. Yes, I think so. I could verify that, I think, in a moment (strikes two pistons together). Yes, it is somewhat softer than Exhibit 1.

Q. And that would permit the scuffing off and wear, wouldn't it, being softer? A. That would make the elastic limit somewhat less and produce that flow of metal a

little easier, certainly.

Q. Now, Mr. Richey calls your attention to Exhibit FFF, and he called your attention to the "W: M. L. Co." and "Magnalite" on one side of the piston. Now on the other side of the piston you see "E. C. Long, Detroit,"

don't you! A. Yes.

Q. You still believe that this particular piston was sold to Franklin direct by Aluminum Company of America, or Walker M. Levett? A. Oh, I don't know about that particular piston in view of that on the other side of the boss, but the Aluminum Company or Levett certainly sold direct to the Franklin Company.

Q. But do you know that Mr. Long also sold pistons direct from Detroit? A. No, I didn't know that.

Q. And you didn't hear Mr. McCoy say that after Long promised to be good and bky all of his centings from the Aluminum Company or other licensees, that the suit against him was dismissed? A. Well, if I heard it I didn't pay any attention to it.

Q. Do you know what years the Aluminum Company of America sold pistons like that Exhibit PFF to the Franklin Company? A. No, not from the records; just from my recollection of seeing the eastings around the plant. It was according to my recollection some time from about 1920 to about 1926.

Mr. Bruninga: Re-direct examination closed.

Therenpon, the defendants called as a witness in surrebuttal; Guonos P. Donnes, who being first duly sworn, testified as follows:

. Drager Examination by Mr. Bruninga.

Q. What is your name and age! A. George P. Dorris.

Q. Where do you live! A. St. Louis, Mo. Q. What has been your general education, just give it very briefly? A. High school and general school in Nashville, Tennessee, one year in Vanderbilt University, and from there on up through the gasoline angine busi-

ness, up to this time

Q. What has been your experience, very briefly, in gasoline engines in automobiles? A. I built my second engine between 1890 and '92. That was a motor bent proposition, and that was operated for four or five years, and driven around Nathville and from Nashville to Bowling Green, Kentucky, where it was sold. During that time I had the agency for the Poos Gas Engine Company of Springfield, Ohio, and sold a number of engines in southern Tennesses and northern Alabama to operate cotton gins. I did quite a little contracting work in keeping those engines running, and other engines. I kept in close touch with what was going on in the gasoline engine business and in 1893 John Li French and myself pent two weeks in Machinery Hall at the Chicago Worlds Fair, where we paid particular attention to all the gas engines on exhibition there, which were principally of foreign makes, English, German, French and Swiss. In 1895 there was a read race or motor race of motor cars, or horseless carriages field in Chicago and I began to build a horseless carriage at that time, which I had operating in the summer of 1897. That was run around Nashville up to previous to Thanksgiving of 1898, when it was shipped to St. Louis where the St. Louis Motor Carriage Company was organised of which I was vice president and chief engineer. They began building motor care at that time, and from 1960 up, we had been fairly successful in the motor ear business. In 1903 the partner there, John French, died from an automobile accident in Pittsburgh, and in 1905 that company was moved to Peoria, Illinois. I resigned at the time and formed a new company at St. Louis known as the Dorris Motor Car Company, and was vice president and president and engineer of that up to 1927, January. I spent two years with the Sterling Products Corporation as sales engineer from January, 1928, until about January, 1930.

Mr. Richey: Just a minute. This seems like it is going to amount to a good deal more than I thought. I think you ought to make your application for leave to take surrebuttal, so we can have a ruling on that.

Mr. Bruninga: There are several matters which came up, and I have the right to rebut. He is stat-

ing his qualifications as briefly as possible.

Mr. Richey: I want to enter a general objection to taking any surrebuttal testimony. It has not been shown there has been any improper rebuttal testimony, or any reason for taking surrebuttal.

The Master: I think you may have your objection, and the question can be raised later.

Mr. Richey: Of course if this is an expert, we put Dr. Jeffries on and we thought when he left you were at the end of the case. You didn't say you were going to put another expert on. I would like an adjournment to tomorrow morning so we can have him here.

Mr. Bruninga: He can read it. I am going to put on that other witness; I agreed to have him put

on.

Mr. Richey: All right, then, if it is all right for him to read the testimony, very well.

Mr. Bruninga: Oh, yes, yes.

Mr. Richey: However, don't withdraw my objection to its being improp a prebuttal testimony.

Mr. Bruninga: If you have any cause to reply to Mr. Dorris, you can do that at any time.

Q. Now, this Dorris Motor Company was the manufacturer of the Dorris automobile, isn't that right? A.

Q. Can you tell me what class that automobile was in with reference to thetPackard and the Cadillac and cars of that kind? A. Well, we ranked with them right along.

Q. Would you say it was successful or not a suc-

conful car! A. Yes, successful.

Q. Now, you said you were chief engineer of that company! A. Yes.

Q. Until it stopped business in 19271 A. Yes.

Q. Now, what experience have you had with pistons, and I may say if you had any experience with the making of cast iron pistons? A. Why, I designed everything that we used at that time, because there was very little to follow outside of the older stationary engines that were in use at that time.

Q. Did you have any experience with the making of slipper pistons? A. Yes, comparatively recently

1916-1917.

Q. Did you have any experience with the testing of aluminum pistons? A. Some.

Q. While connected with the Dorris Motor Com-

pany! A. Yes.

- Q. Going back now prior to the year 1914, including particularly the years 1911 and 1914, what kind of tests were given pistons in those days by the Dorris Motor Company? A. We had the practice at that time of pulling an angine by a previously started up engine for a day's time to work the frictional heat out of it, and the next day that was put under gas and it pulled the next succeeding engine and helped take the friction out of it.
- Q. Now, you have heard the expression "block test" used. What is the block test of an engine, and particularly with reference to pistons, and what was it in 1911 and 1914? A. It was a limbering up test and included the measurement of power and other essential details.

Q. Was it the practice to run-in the engine then in those days, in 1911 and 712 before it was put in the

chassis? A. Oh, yes, some.

Q. Did you have any actual experience yourself in the testing of pistons as distinguished from running them in, for the years 1911 and 19141 A. I devoted most of my time to the development and progress in the performance of the engines and all the details.

Q. Did that include the testing of pistons? A. It

did.

Q. Did you have any occasion to test pistons as to whether they would function properly as distinguished from running them in f A. Oh, yes, various troubles.

Q. I want you to keep your testimony right down to 1911 and 1914. Hew was the test of a piston conducted in 1911 and 1914 to see if it would function properly—was it put in an automobile or put out on the road, or stationary? A. We used to put them in stationary, usually load them, let them run a few hours, push them up a little and push them up intil they would seize and the troubles would show, and at what speed it would perform. After we had arrived at the particular piston we knew just about how much it would stand, and if that was as good as we had up to that time, that was passed, it was O.K.

Q. Was any particular attention paid to clearance in those days? A. Oh, yes, certainly; that was gauged

very accurately,

Q. Now, how much of a test was a piston run before it was determined that it would operate satisfactorily in your opinion? A. Oh, if we were going to make a change from one piston to another, we would give it maybe a week's time before we would make a decision, running every day.

Q. Would that be in a stationary test? A. Prac-

tically, yes.

Q. Can you tell me about what equivalent in mileage that would be before you would be satisfied with the correctness of the construction? A. I would say around a thousand miles.

Q. Now, there was such a thing as a road test of

an automobile? A. Yes.

whether a piston would operate or endure? A. Partly. Principally to limber up all the chassis bearings.

Q. Now, is a piston like a spring or a wheel or a steering gear on an antomobile, that you have to test it on the road before you can determine whether it will operate satisfactorily? A. You can get a better answer from the block test because you could keep the heat on continually. You can't do that on the road.

Q. But you cannot run an automobile while it was standing still and just run the engine if you want to test a new steering gear, can you? A. I didn't quite catch

that.

Q. Well, when you want to test a new steering gear?

A. Oh, we had to go on the road.

Q. And that is also true of a wheel and a spring,

is that right? A. Yes.

Q. But did you find that necessary in order to test out a piston, whether it would seize or endure! A. No.

Q. Were you acquainted with engineers of different automobile companies in those years, 1911 and 1914? A. I knew practically all of them.

Q. Did you belong to any engineering society? A. I have been a member of the S. A. E. since 1910.

Q. Did you find in the years 1911 and 1914 the automotive engineers would test out a piston by giving the car a road test on a block test! A. Some of them made both, manally

Q. When they gave them a road test, was there something else on the ear besides the piston that wanted to be tried out? A. Oh, a number of things always.

Q. As far as principle of operation and construc-tion is concerned, does the block test tell you may thing as to principle of operation and endurance and proper blearance of a piston, does the block test tell you what you want to know, or is it necessary to make a road test! A. Very considerable.

Q. The block test does? A. Drive them until they would stick, then not where they would stick and then file them off where they showed high pressure.

Q. Now, you have seen Rahibit 48 in this case,

havnu't you! A. Yes.

Q. And you have heard Mr. Gillich testify as to a block test on that type pistos? A. Yes.
Q. Can you till mo whother the block test would show up, whather the principle of operation and the blearance would be correct on the piston that he testified

about? A. I think so.

Q. I Bo you think it was accompy to run a 2000-mile road test in order to determine what her the piston would still or whether it had enough clearance? A. No. the block test was mach more severy than the world test.

Q. In a block test you could run your engine up to imost any speed on the wide open throttle! A. Yes,

g. Could you do that with a road test? A. No.

Q. Now, you have heard Mr. Gulick testify about this Exhibit 51, this aluminum piston? A. Yes.

. Q. Do you consider that a road test was necessary for that as distinguished from a block test? A. I wouldn't consider it as important.

Q. Would you consider that it was necessary to test

that out for 4500 miles?

Mr. Richey: Object to it as leading.

A. I would not

Q. You found that parts of an automobile break after it has been out in service, haven't you! A Yes.

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A VERTICAL VI

Q. Is that always due to defect in principle of operation? A. No, mostly straight breaks, unless the part is inherently weak, in such once that is usually stiffered up.

Q. Nov. hosping to the years 1911 and 1914, as I understand it, after an engine was fallahed it was put on and van in at first stationary, is that right? A. Yes.

Q. You first read the augine to be weeked in with

Q. And then you followed that up by taking that engine and let that remandiber regime? A. That is correct.

Q. And that was followed up by patting that engine in a car, suit that right? A. You

Q. Now that was done in regular commercial oper-

stion, want't fif A. I That was the custon.

Q. And what was the payers of the read test on the core that were in regular production? A. (Check ofjustments and help to work the frieties out of the engine and other parts.

Q. Now, you were in court yesterday and heard Mr.

Schoonsouth smility all want A. Yea sair

Q. And have you said the Schoolgarth patent that

Q. What have you to any about the practicability of that plates as shown in the relate!

Mr. Bleboy. It object to that as not proper surrebuttal. He went has that with Mr. Bulbann, and

hee out in his case on that

Mr. Dennings: No. I am unking this witness to only testify; not from the patent structure, but from what he heard Mr. Echomograph testify as to the picton that he constructed, that he said he constructed and operated in 1918.

The Master: Same raling on that,

A. I don't ere mything that would keep it from op-

Q. In your opinion was the plates that Mr. Schoolgarth described and which he said he operated in 1915

practical for one to were sylinders! A. Yes.

The second secon

Q. Did you examine Exhibit 5-K10! A. Some.

Q. Well do you understand the principle of adjust-

ment? A. I think so.

Q. Do you know how the adjustment works? A. Yes, he has a taper head screw fitted into a tapered hole. which is between or in the vertical slot.

Q. Do you consider that principle of operation prac-

tical or impractical? A. That will work.

Q. Now, Mr. Schoengarth also testified yesterday that he had made a piston generally as shown in his patent 1,174,092, without the adjustment and with the slot. 4 practically vertical, he filed off at the side, dressed it off above the slot 3, that it was between one and a half and two thousandths oversize, and he put it in a cylinder and ran it. Do you think that operation of fitting such a piston was practical! A. Yes.

Q. As he described it, can you tell me whether or not you would consider a piston like that would function

in a cylinder! A. Certainly.

Q. What have you to say about any compensation for expansion in such a piston! A. Why, it has two major functions here: one, the segregation of the skirt from the head, which stops direct transmission of heat to that portion of the skirt adjacent to the slot, which naturally forces more heat to be carried out through the rings and lesser degree of total heat transmitted to the skirt: there is also the vertical alots which permit a greater degree of figuring of the skirt and possibly closer fitting, without danger of seizure.

Q. What would have happened if he had not dressed down the part above the slot 3? A. Why, if you drive it under that condition it would have soon scuffed off.

Q. Why would it scuff off without seizing at the skirt or without seizing at that point? A. The temperature would expand it to a greater degree than the skirt would expand it.

Q. Why wouldn't it seize! A. From the ratio of size here, there wasn't sufficient metal to produce seri-

ous seizure.

Q. Do you know that from experience or just from theory! A. Yes, we have had the ring lands seize when

they weren't relieved enough.

Q. But how about coulding off of a narrow part, have you had any experience with that? A. Apparently you can heat that to a higher degree of heat on account of the lask of backing or metal to absorb the heat or friction, so that naturally a metal would soften up

with that temperature. When the piston seizes it really melts the surface of the metal, so the heat must be pretty

high, and that proffuces scuffing.
Q. Mr. Schoengarth discussed the fact that the dressed off the sides of the piston in the region of the wrist pin bosses. Do you know whether that was an absolutely new practice in 1915? A. That was a universal practice from the beginning of the gasoline ongine. Unless you did that you had no degree of fit at all.

Q. Did you ever do that? A. Had to do it. Q. How far back! A. Oh. 1900 and up.

Q. If you ram a pistor a while in a sylinder and that relief isn't there, what happens? A. It would indicate where the pressure had become higher. If you continued in pushing that piston to more heat and speed, it would naturally scuff and burn and it would be naturally relieved.

Q. As a mechanic, what has been your practice when you found a part fitted too tight? A. Why, we looked for the part that was carrying the high load, and

eased it up, just like scraping a bearing.

Q. Now, as far as Mr. Schoengarth talked about relieving the piston that he put in that Sullivan & Cumbe car just above the slot and below the lowest ring land. and which did not have the adjustment, can you tell me whether that was a new thing to do to make the piston of less diameter below the ring land than the skirt? A. I don't think so.

Q. How old do you know that to be? A. Right from the beginning of the horizontal slotting, the time

that was first produced.

Q. Are you familiar with the Howe patent? A.

Yes, sir.

Q. When did you become familiar with it? A. In 1911, the oil pumping began to be a serious factor on account of increased engine speed and it became necessary to relieve the piston at that point to let the oil flow back into the cylinder. We got this idea from the Continental Motor Company, and later one of Mr. Howe's relatives was around selling licenses on it and we paid \$75.00 for the license on that patent.

Q. Do you know what the practice was among other automobile manufacturers ! A. They all accepted that

as coon as it became generally known.

Q. How early did your sompany take a license under the Howe patent? A. About 1911.

Q. Can you tell me whether or not that practice was in use or did it come in later! A. The first we knew of it, it come to us through the Continental Motor Company. Marine to the

Q. What year was that? A. Oh, it might have been

1910.

Q. Did you notice it in the pistons of any other cars? A. Oh, it appeared fairly generally about the same time.

O. About 1910 or 19111 A. Yes.

Q. Now. Dr. Jeffries talked about the Franquist. piston, both on prime facie and on rebuttal. He talked again on rebuttal and then berees examined him as you heard. Have you read that Franquist patent? A. Yes.

Q. Have you seen these two exhibits 3 Q and 5 L?

A. Yespin managed managed and a series and a

Q. You saw the test that was performed this morn-

ing! A. Yes, sir.

Q. From your understanding of that patent from your examination of these two exhibits and from the test, can you tell me whether the skirt of that piston is flexible or is it stiff; too stiff to operate in an engine? A. It has a degree of flexibility.

Q. What in your opinion about whether it will operate in an automobile engine? A. It will.

Q. Do you think it will compensate for any expansion.

sion! A. To come extent

Q. Are you familiar with pistons of the character of

Exhibit 17 A. Inam.

Q. Will you compare the Françaist piston and Ex-Ebit 1, particularly as to functioning at the top of the skirt! A. Well, it has this same segregation of skirt from the head, practically identical with the No. 1. It has some internal east ribs that are slotted, which provides a greater length of metal for the skirt for its diameter. It has a feature here which is not described in the patent, which is workable, and that is radial expansion of the head has a tendency to pull out the boss walls. which would automatically, to some degree, pull in the cross walls or side walls, which would help or assist or work in harmony with the intentional resiliency or flexi-

Q. Do you base that on a mere theory or experience? A. I have had experience with similar pistons on that same principle except that it didn't have the grooves, it had greater reliefs on the side, carried around a little

to the state of the state of the

farther.

Q. Did you ever test a pisten like Exhibit 11 Yes.

Q. Did you find it very flexible at the top of the

skirt! A. Not very much so.

Q. Do you consider Enhibit I more flexible or loss flexible than the skirt of the Françaist patent? A. I would I couldn't say on that positive but my opinion would be they wouldn't be far spart on that, especially if the Franquist had about the sit as the number 1.

it as the number 1.

Q. New, when those these, when those alots were partially closed this morning by the test that was given them of clamping in the slot, what happened, did it increase or decreased A. That there are the circumference and consecutatly reduced the dissour.

Q. Dr. Jeffries also breaght up on prima facie, and again on rebuttal; this Kant disre pisten, Richibit 3-Z. What do you know about that pisten so far as commercial use is consecutated. cial use is concerned?

Mr. Richey: Objected to as improper surrobuttal. You went into that in your case in chief, all that we did was answer you. The Master: Same raling

A. Why, this has a negrogation princi

Q. I am not asking you about the construction, I am asking you what you know about its commercial acceptance! A. Well, it was need, had quite a little nee but developed breakers.

Q. Was that piston over sold by suybody that you

know? A. By the H. & H. Manufacturing Company of St. Louis, that were engine service men, sold that piston. Q. Omprima facie and again on rebuttal the question of this relief of Exhibit No. 1, adjacent the thrust faces, was brought out. Have you anything to say about that, based again on experience and not on theory!

> Mr. Ribby: Same objection. The Master: Same raling.

A. Why, this particular design developed localised high pressure spots at these upper corners of the cross head shoe, the one with the split, to such an extent that if that was driven above 60 miles per hour or continuously, those would be scalled down. If they were relieved, which they were extensified for high was done by wear, the space would be increased. In fact, the drag on that piston was such at 65 miles per hour to limit its speed, and an replacing pistons with less expansion or

tension against the cylinder walls the speed was put up to 75 miles per hour, with change of pistons alone.

Q. You mean with that same piston? A. Well,

with other design pistons.

Q. Now, did you look at this Exhibit 73, the Bicardo

piston! A. Yes, I noticed that.

Q. If the skirt, particularly the wide part, were shit, do you think the webs of that construction would flex! A. It would.

Q. What have you to say as to the flexure of the top, would there be any flexure at the top of those webs,

out as they are? A. In here?

Q. Yes, would there be any flexure of the webs at the top, out back as they are, as shown in the Exhibit? A. Well, it would be a little better than the No. 1 exhibit on account of the greater depth of alot at that point.

Q. You heard Dr. Jeffries testify of performing certain tests with the pistons on a bathroom scale by standing on them. Did you ever perform any tests on pis-

tons that way! A. No.

Q. Would you ever think of testing a piston that way! A. We always tried to get a mechanical gauge to

tell us the truth.

- Q. Do you think that is a fair test of any piston, to stand on it on a bathroom scale! A. I wouldn't accept it
- Q. Do you think it would teach you anything at all? A. Not serious.

Q. Now, the Ford piston, Exhibit 3-J. Do you un-

derstand that piston! A. I think so.

Q. Now, assuming that it is slotted, or even that it is not slotted, what is the function of that cam-grinding in there? A. Why, it transfers the contact of the working shoe a further distance from the base of the slot, the horisontal slot, and therefore permits a greater degree of, a very much greater degree of flexibility than in the case of No. 1. In other words, the points where they scuff the most have been removed. There is another feature here, that is a circular wall would be better because it would be hinged a greater distance from the vertical slot, which would permit a greater degree of flexibility with the same degree of flexion in the metal, or the clastic flexion of the metal.

Q. Are you familiar with Defendants' Exhibit 3-0.

the Plymouth piston! A. Yes.

Q. Did you find any flexible webs in that piston? A. No, no webs in it.

Q. Are you familiar with the Mooers patent 1,402,-

Q. Do you consider 3-O a copy of that patent? A.

I would not.

Q. Do you see any resemblance between them at all? A. Not from a functional point of view, except the partial segregation and nearly full segregation on that piston.

Q. There is nearly full segregation on the Mooers

patent? A. Yes.

- Q. And how much segregation do you find on the 3-01 A. Between a third and a half, not far off from a third.
- Q. Do you think that little slot of part way gives you much segregation as far as heat transference from the head to the skirt is concerned? A. When almost two-thirds of it is a solid connection; it would be in the ratio of the length of slot from the head to the circumference.

Q. What is the function of the vertical slot in that piston? A. That is to permit an expansion joint to take care of the excess expansion of the skirt on account of the heat that is transmitted from the head to the upper end of the skirt.

Q. Can you see any similarity between the Gulick patent and that piston, assuming you have read the Gulick patent? A. Well, this would be considerable

less metal in it.

Q. I mean as far as structure is concerned?

Mr. Richey: Let him answer, now.

A. Yes, the Gulick has a continuous segregation and the heat and the thrust is transmitted through two inner walls, and the skirt is carried by the inner walls. I understand that that skirt is split to take care of circumferential expansion.

Q. Do you find the slot going all the way down on

3-01 A. This does not.

Q. What would you call that slot in 3-01 A. Commonly known as a T-slot.

Q. Do you find such a T-slot in the Gulick patent?

A. No.

Q. Do you find any flexible webs at all in 3-0?

Mr. Richey: Oh, he has answered that. Don't lead him so much.

Mr. Bruninga: That is not leading.

A. If you distinguish web from skirt, I would say

Q. What I am talking at at is these webs 17 and 18 of the Guliek patent structure. Do you find those webs in 3-01 A. No.

Q. The bottom of the skirt of 3-0 is solid? A.

Yes, sir.

Q. Can you tell me whether that has any effect on the operation of 3-01 A. I think it is very beneficial.

Q. In what way? A. Why, in all pistons the real ion carries with it the skirt, and where the slot is continuous, it has a tendency to pull apart or open up that slot, which is contrary to what you want to do. In this case the lower edge of the akirt is continuous and prevents any opening up of that part, and on account of its being continuous allows the side walls to move out under the radial expansion which automatically will pull in the cross dimension. The upper end of the skirt where it is adjacent to the head is very much stiffer be-enuer of its contact and connection with the head, can-not be made quite so flexible, but by virtue of the T-slot construction the piston is made flexible at the upper and and not so flexible at the lower end, and that is the desirable factor that has been sought for some time.

Q. I believe you said that pistes had an expansion joint at the top in the slot? A. It can be considered so.

Q. How long to your knowledge have expansi joints been used to take up for heat, not in pistons, but in things in general? A. Ever since I was aid enough to recognize temperature in working with metals.

Q. What would happen if you ran the alot all the

way around 3-0, as in the Guliek patent structure; would the head stay on or drop off? A. Wellagt would almost be off, if not off it would in this piston it would be off.

Mr. Bruninga: That is all.

Choos Examination by Mr. Richey.

Q. Are you still employed by the Sterling Products Corporation! A. No.

Q. You have been here throughout the trial, assist-

Q. Is the Sterling Products Corporation paying you for being here!

Mr. Bruninga: I don't see where that has anything to do with the insues in this case. He can ask if his expenses are paid, but the purpose of counsel is obvious.

Mr. Richey: It is just a matter of prejudice,

nothing else.

The Master: I think he may answer to that You are entitled to mk that of any witness, if he is being paid.

Mr. Bruninga: It is all right to ask him if he

is being paid, but not who paid him.

The Master: He may answer.

A. I am here at Mr. Bruninga's request.

Q. That doesn't sawer my question. Tell me who is paying you for being here? A. Well, Mr. Bruninga; it may come from Sterling, I don't know.

Q. You have been paid already for some of the time

you have spent here, haven't you! A. Yes.

Q. Who paid you for that? A. It was paid me by Sterling.

Q. Sterling Products Corporation? A. Yes.

Q. As a matter of fact, although Mr. Brunings recommended you to come here, your arrangements were

made with the Sterling? A. No.

Q. You didn't talk with anybody from the Sterling Products Corporation about coming here to tentify? A. Afterwards it was discussed with Mr. Brunings. He was Q. Also, with employees or officers of the Sterling

Products Corporation

Mr. Brunings: I raise an objection again. The witness has already said that.

The Master: I think he has answered that.

Mr. Brunings: He has answered the question and the rest is for obvious purposes. As a matter of fact, the answer should be stricken out.

The Master: Oh, I think he may answer.

Q. You also talked with officers or suployees of the Sterling Products Corporation about sening here and testifying in this case, or about this testimony? A. Oh, after Mr. Brunings called me up, yes, I went up there to get a couple of arbibits.

Q. Now, this pisten, Erkibit 1. Sterling Products Corporation manufactured pistons like that while you were those didn't they? A. Yes.

Q. What were was that! A. Oh, it winds have

Q. What year was that? A. Oh, it might have been 1919, I think.

Q. What year? A. No, no, 1980. It might have been 1929, I know they weren't making that when I first went up there.

Q. Before they finally adopted this piston like Exhibit 1 they tried to market several other different kinds of aluminum pistons, didn't they? A. Yes.

Q. One of those pistons had an iron strat in the

head, didn't it?

Mr. Bruninga: Same objection.
The Master: Same ruling; he may answer.

A. Yes.

Q. You tested that piston out, did you! A. Yes. Q. And you finally gave it up, didn't you! A. No.

Q. You haven't made or sold any of them like it, have you? A. Not for the present that I know of.

Q. Not since you adopted the one like Exhibit 1? A. I can't say. They may have sold some, I don't know.

Q. You recommended that piston to Ford, didn't you! A. Yes.

Q. And they tried it out and gave it up?

Mr. Brunings: I want to make an objection. It is entirely outside of the direct examination; I don't see it has any bearing.

The Master: Go ahead and answer the question.

A. The reason for them giving it up was price.
Q. Well, they gave it up, that is the question? A.

Yes.

Q. Now, the Sterling Products Company also tried pistons with other forms of splitting other than that shown in Exhibit 1 before they adopted Exhibit 1? A. That was some time back in 1925—'22, somewhere in there.

Q. And those were given up either at or prior to the time Exhibit 1 was adopted? A. I don't know what success they had with them in that time. I joined them

when they made that Invar insert piston,

Q. Did you know that the Aluminum Company or Aluminum Industries, Inc., or the Bohn Aluminum and Brass Company, or any of them, were making pistons like or substantially like Plaintiffs' Exhibit 1 at the time that Sterling Products Corporation adopted that piston?

A. I think so.

Q. Had pistons been made by one or more of those companies before that piston was adopted? A. Yes.

Mr. Bruninga: I would like to centinue my objection. This is going into the suit against the Sterling Products Corporation.

The Master: He has testified he worked for them. I assume he can be cross examined on that, as to what they were doing.

Mr. Bruninga: That is outside of the issues of

this case.

The Master: I understand so, but the question came up in direct and to a limited extent I will permit it now.

Q. When did the Dorris Motor Car Company go out of business? A. In 1927.

Q. What did they do, go into the hands of a re-

ceiver! A. Yes.

Q. Back in 1911 you were using a trunk type iron piston! A. Yes.

Q. That was standard production, wasn't it? A.

Yes

Q. At that time. And the pistons you tested and

described here were pistons of that type! A. Yes.

Q. And what you were doing in those tests was taking that standard type of piston in a standard car, that was right, wasn't it? A. Yes.

Q. And even in those days you put the cars on the road and ran them a while, didn't you? A. That was.

part of the tuning up.

Q. How far did you run the cars in the test? A. From 50 to not more than 150 miles, usually a day's run.

Q. And you run them farther than that now! A.

Don't run them at all now.

Q. That is, since the aluminum pistons came in Ford doesn't run all the cars on tests at all, does he? A. Practically not.

Q. You had a regular force for testing Dorris cars

back in 1911, didn't you? A. Yes.

Q. Did you have your own car back in those days? A. Yes.

Q. And you sometimes ran the company's cars,

didn't you! A. Yes.

Q. Did you sometimes test the new equipment on your car or the company's cars! A. Both ways.

Q That was quite the common practice, wasn't it?

A. Yes

Q. And you ran it a mileage depending on the character of the device under test, didn't you! A. Oh, not necessarily so. I ran the mileage because some one test demanded, and maybe not all the factors. We tried to couple up as many experiments as we could on one car.

We usually had two experimental cars, one of them going practically all day, someone was driving it.

Q. Before you recommended the use of a new device on your car you would have it thoroughly tested out? A. To the extent if would show it a betterment over what we were using

Q. You leaned on the side of overtesting rather than undertesting! A. Oh, I don't know; we had more or less serious troubles all the way along with pistons

seizing.

Q What I mean is you would rather run it more miles to show it was good than run it less miles? A. That depended on the time we had to push it, to get them ont.

Q. Of course when you were busy you would take

a chance on undertesting? A. Yes,

Q. Not being busy you took a chance on overtesting rather than undertesting! A. Put them in and broke them, see what would happen to them, if it was in a car where we wanted to shift.

Q. That was true of all parts of the ear, not only pistons but lots of things? A. Yes, whole thing tested

out together.

Q. With new aquipment you were never esticifed with the stan lard test to break the equipment in such as road tests made by new cars reported by your testing department? A. Oh, I don't get you exactly on that.

You say satisfied?

Q. What I am getting at is this, that if you were trying out new equipment, comething you had never used before, a new device, you were never satisfied with just the kind of test you made on standard devices, were you? A. No, we run tests on two cars, as a rule, before it ever got to production, before we got to a position to try it out in production or not.

Q. You say production. What do you mean by pro-

duction? A. Every day delivery work.

Q. Operations on a new device up until the time you went into production was testing, wasn't it? A. Yes.

Q. What you have said now about 1911 was true of 1914, wasn't it? A. About the same.

Q. And the practice you have described was pretty

general, wasn't it! A. Yes.

Q. Equipment that was employed in an engine was as a rule tested inside and outside both, wasn't it? n. Yes.

Q. The breaking of a piston in a motor is quite a

serious matter? A. Not always.

Q. It is difficult to get in there and remove it, im't it? A. Oh, you have to take the head off and take the pan off to get at it.

O. Sometimes when the piston breaks it ruins the

cylinders, don't it! A. Yes.

Q. Now, before you would adopt a piston as standard equipment, you would have to be estimed it wasn't going to break in the cylinder? A. We would, if there was a danger of that; we would question that very serionsly as to whether it would stand up. And the engineers at that time were prejudiced against slotting the iron pistons, and that is what prevented a bigger showing of slots previous to what has been shown here.

Q. That is, they were afraid of these things? A. The weakening of the structure and afraid of breakage.

Q. So they wouldn't adopt any aluminum piston? A. Not aluminum-iron piston.

Q. I mean any iron piston that wouldn't be practically 100% perfect as far as breakage was concerned?

A. Oh, yes, they took a chance on lots of things.

Q. II am asking a question about pistons; answer the question. A. Well, if it showed signs of being a betterment of what was used previously, they would give it their consideration.

Q. But a piston had to be more perfect with respect to lack of danger of breaking than other equipment? A. Oh, yes, it was given a front place in the testing, recognined as one of the vital spots of the engine.

Q. It was recognised for a good many years that

the iron piston was too heavy, wasn't it? A. Yes.

Q. And also it wasn't as good a conductor of heat as it should have been? A. Yes, that is true.

Q. And it was known, at least from 1911 on, that aluminum was lighter and a better conductor of heat than ironf A. Yes.

Q. And therefore better material for a piston? A. Yes, and that a sand east piston was poorer and that was held up for some time because of the lack of better bearing, it souffed freely.

Q. The sand cust? A. The sand cast, and that de-

layed progress in that direction.

Q. But even after the permanent mold piston came in, those things were recognised, as I said, about the advantages of a piston! A. Oh, res.

Q. You talked about the piston shown in the Schoengarth patent. Except for the testimony you heard Mr. Schoengarth give, you never heard of that piston being

used commercially, did you? A. No.

Q. Now, if that piston was adjustable and locked with a locking washer or nut, as Mr. Schoengarth said, the piston would not flex in use, would it? A. It would only serve one purpose, that is the adjustment; the same as the adjustment of a bearing; there might be a slight amount of flexibility between the adjustment on account of the slot.

Q. How often is it necessary to adjust a piston! A.

Oh, formerly about every 20,000 miles.

Q. Now, this piston 5 K10, except for what you heard Mr. Schoengarth testify, you never heard of that piston having been used commercially? A. No, that is new to me.

Q. And that piston would be rigid and non-flexible when the adjusting means were set, wouldn't it? A.

Practically the same as a solid skirt piston.

Q. You don't mean to say there would be any flexibility in that, do you? A. Not in this particular example; depends on wall thickness a good deal. It might be assisted by that slot in some degree with lighter walls.

Q. In other words, if you made the walls so light it couldn't be used as a piston, it might flex? A. Ob, no it would be the same as that Deluxe piston, 3 H.

Q. Were you familiar with this Franquist piston at the time that you were struggling with that Sterling pieton before you adopted pistons like Exhibit 17 A. I was not, but Mr. Clameng and Mr. Bowser possibly were.

O. And that Franquist piston of course was not adopted by them? A. No.

Q. You said you had an experience with pistons similar to the Franquist piston. Just what piston did you mean when you said that? A. It was a trunk type, continuous skirt piston, of light walls and a big rib between the two bosses, and a very large clearance on each side so that the cross-head shoes were comparatively small. The radial expansion of the head of that piston was sufficient to push the end walls out sufficient to pull in the side walls, so that the application of heat actually reduced the diameter of the cross-head section of the pis-

Q. That was a trunk type piston? A. Frunk type piston and no slots in it at all.

Q. What was the name of that piston? A. They didn't give it any name.

Q. When was that piston? A. Sometime between

January, 1928, and January, 1930.

Q. Was this when you were with the Sterling Company? A. Yes.

Q. Did you test that piston out? A. Yes.

Q. In the laboratory? A. Yes no, in the shop and in the car on the road.

Q. For the Sterling Products Corporation? A.

Yes.

Q. They didn't adopt that piston, did they? A. Not as yet.

Q. Well, are they still testing it? A. I don't know. Q. Were they when you left there? A. I couldn't

SAV.

Q. This Spillman piston you talked about, when did the H. & H. Company discontinue the sale of that piston? A. I don't know. Mr. Charley Marien was the one that had the contract for that piston, and the H. & H. Company—he started the H. & H. Company. They have been in business there in St. Louis for quite a long time.

Q. It has been a good many years ago since they discontinued it? A. Ob. 1917—118—something like that,

maybe before.

Q. Who made them, do you know? A. They were

made in Cincinnati.

Q. Well, aren't you a little early on that dute? A. Maybe so, I wouldn't be positive about that. Anyway, they were offered to us and I never did try out any of them because we were afraid of the breakage factor on them.

Q. Do you remember what year they were offered

to you! A. Oh, it might have been '20 or '22.
Q. Where did they break! A. They would break

the wings, the ones we had.

Q. They would first collapse before they would break! A. Oh, yes, yes, they would hammer after they got loose, too loose, they took a permanent set is what led to the breakage.

Q. What do you mean by "hammer"? A. Well, after these had been pushed in by lack of strength enough to resist the thrust, the diameter would become small, and then they would set up a terrific hammering, then they would knock the wings off.

Q. You mean by hammering, they would flap in the engine! A. In the engine, yes, cross hammer from the

thrust.

Q. I suppose that was an objectionable thing, that re, waen't it? A. It sure was

Q What had to happen when that happened? A. aybe you moded a low engine.
Q Well, at least the pistons had to be removed,

Q. And why would they cometime have to have a consting red, and that would wind it up. Get loose in the chart part.

Q. Punch hades in the creaters.

what happens when a piston breaks in an so, im't iff A. Oh, the skirt parts, that the off and fall on a law very of the presidence, it may not up a little union but it wouldn't be man than the actual breaking of the plates, it was not manufactly and the same would give g of the pisten, It athing was wrong, so naturally it was

Committee that would be you and constitute the same of ly, did you? A. Oh. I rend of it in the Engh motor p

ow of amphony stepting it. I believe that our Mr.

Q. When was that? A. That was quite a long time when Mr. Penseroy joined the Aluminum Company, ago, when Mr. Pomeroy joined the Alun I believe.

Q. You mean he used it experimentally in his ear?
A. Oh, yes, experimentally. It was discussed through the S. A. E. meetings.

(Thereupon adjournment taken to 9:00 A. M. the following day.

At 9:00 A. M., Friday, March 24, 1933, the hearing was resumed.)

FURTHER CROSS EXAMINATION by Mr. Richey.

Q. Mr. Dorris, did you keep in touch with piston. needs and development of pistons while you were employed with the Dorris Company prior to 1920? A. Yes.

Q. Did you ever try out a trunk type aluminum piston in any of your cars? A. I don't remember a trunk type, but a kind of cross-head type.

Q. That is, it had a solid skirt? A. Solid skirt,

but segregated that from the head at the two shoes.

Q. And something like that Ricardo piston? A.

Closely to that, not exactly.

- Q. What was the result of trying that out? A. Why, they would stick up after it would run, like all pistons; they were both too large and too small at the same time.
- Q. As a matter of fact you ran one in a car and had to stop the car and take the pistons out on the road?

 A. I did that four times.
- Q. And tried to get them to fit, didn't you? A. Why, apparently there was no room for so-called fitting to correct the real trouble.

Q. And after that test you continued with the iron

piston, didn't you! A. Yes.

Q. Now, after this aluminum piston like the Maxmard type came on the market, did your company adopt them? A. No.

Q. You know those pistons were generally used,

don't you! A. Yes.

Q. This trunk type slipper piston you said was like the Ricardo that you tested out. When you took it out, changed it and put it back, what did you do to it? A. Oh, there was nothing to do to it. I just get disgusted with it. That was what they called a semi-die cast casting, supplied by one of the Aluminum Companies, either here or Detroit or Manitowoc.

Q. You say they stuck up you mean would seize!

A. Yes, would seine.

Q. Did the other engineers at the Dorris Company.

know about this? A. Oh, yes, sure.

Q. Did you make any changes in that piston or try to make any changes in it to remedy that? A. Not seriously. We depended on the Aluminum Company to give us something that Sould work.

Q. When was that, do you remember? A. It might have been around 1918 or 1919; it was after the armistice,

I believe.

Q. Did you continue to use the iron piston up until your company went into the hands of a receiver? A. In 1927, yes.

Q. I hand you a drawing. Does that show the iron piston that you used? A. It looks like one of them.

Q. How long did you use the piston shown in that drawing? A. Well, I won't say that identical piston, but some of the pistons, from about 1915 to 1927.

1.0

Q. Was it used just as shown in this drawing, machined that way? A. I think so. I don't recognize these

(indicating).

Q. You refer to the white figure? A. Yes.

Q. As distinguished from the black one? A. Yes. Mr. Richey: I offer this in evidence as Plaintiffs' Exhibit 79.

Q. Was this your standard equipment, this piston?

A. Yes, sir.

Q. What clearance did you allow with this piston?

A. We gauged the pistons with a piece of paper two thousandths think and two inches wide, so it could be pushed through readily by hand.

Q. What clearance did you allow with the slipper type aluminum pisten you said you brought out? A. I don't remember exactly; it was about three and a half,

possibly, or maybe nearly twice that.

Q. You said you tested the equipment in your automobile and cars of the company that you drove. What type of driving did you do when making those tests? A. Went out to break them up.

Went out to break them up.

Q. You used them in driving across country on Sundays, all that kind of driving we used to do with our families are friends? A. Not always with the family.

Q. Well, I mean sometimes. You sometimes took out your family, sometimes your friends, sometimes other

people! A. The shop car.

Q. What do you mean "shop car"! A. The crew of the company used to go over to the Indianapolis races, back and forth, you see, all the time, and then always four or five from the factory there.

Q. And then you sometimes took other people out

beside the shop people, didn't you? A. Yes.

Q. And you rode back and forth to work in the car?
A. Yes.

Q. And went on errands for the company and your-self in the car! A. Yes.

Mr. Richey: That is all.

Ra-Drager Examination by Mr. Bruninga.

Q. Mr. Dorris, the things Mr. Richey just asked you about, and the try-out of the car, was that for the purpose of just simply testing out the pistons or trying out of the car! A. No, not entirely. We used it as

utility work as well as for experimental.

Q. Take for instance a piston like Exhibit 48, how much of a run would have to be made with a piston like that to show it had the right clearance? I mean out on the road or on the block or any place, or any other way you can think of, how much of a run would have to be made to determine? A. Oh, if that was fit to what we would call a decent running piston to give it a little chance to work the friction out of it, if we would open it up within an hour to get the full heat on it, it would continue to show whether it was going to continue to run or not or whether it will seize.

Q. Do you have to run a piston like that for a month

before it would seize?

Mr. Richey: I object as improper re-direct examination; I didn't ask him anything about that on cross examination.

Mr. Bruninga: There was cross examination on

the method of testing out.

The Master: Oh, he has already answered.

Q. Can you tell me how long a piston has to be run in order to determine whether it incorporates the right principle; I am just taking as an example one like Exhibit 48 and that is all?

Mr. Bichey: That is not proper re-direct ex-

amination.

Mr. Bruninga: Well, then, limit it to anything, any new piston.

A. I would say in a day's run you would begin to know something about it, whether it was better or worse.

Q. Have you found in your experience that a material defect, that is a defect in a casting for instance of a piston, will show up right away? A. Not necessarily.

Q. But has that anything to do with its principle of

operation? A. No.

Q. Or the clearance! A. That is practically in-

Q. Mr. Richey asked you about permitting mechanics or shop men to run cars. Was that particularly to test out pistons? A. Oh, no, for limbering up process.

Q. Now, Mr. Richey asked you whether some present day cars, I believe, weren't run right off of the line without any running in of pistons, and I believe you answered yes. Can you tell me what type cars are run right off the line?

Mr. Richey: I object unless he knows of his own knowledge.

Q. Well, only testify what you know of your own knowledge, and don't guess at anything and don't tell me what you heard others say, or if you have seen things laying around, like Dr. Jeffries did; just tell me what you know of your own knowledge and limit it to that. A. The end of the Ford line in the River Rouge plant, they come right off and are driven right off the end of the line. Now, what happens before they got to that point, I don't know.

Q. How about the Chevrolet? A. I:don't know about that.

Q. You don't know about the Chevrelet. The Ford car, is that a high-priced car? A. No, I wouldn't say so.

Q. Do you know any cheaper priced car than the Ford! A. It is about he bottom, pretty close to it.

Q. Do you know whether the Ford Company instructs the customers to run that car right off the bat at 50 miles an hour? A. I don't know what the practice is now but a few years back everybody practically requested that the speed be kept down until the car was limbered up thoroughly.

Q. Do you know about what speed? A. Oh, that varied; some of them said 30-40 miles, something like that; some of them pasted stickers on the windshield

with that instruction on it.

Q. Was that after 1926 or before 1926, that was the

practice! A. Possibly more before than after.

Q. Now, do you know whether cylinders today are simply ground? A. Well, the process is boring to bring them within a few thousandths of size, and then honed for sizing, and polished.

Q. Was that honing process used in 1911 or 1914?

A. No.

Q. Now, Mr. Richey examined you about the Kant Skore piston, Exhibit 3-Z. Did you ever use any of those pistons? A. No.

Q. Did you ever see them tried out in an engine? A. No, I can't say that I saw them in the engine. I saw

them after they come out.

Q. Do you know of your own knowledge that the piston that you saw had come out of the engine? A. It had the markings on it that indicated.

Q. Are you finished? A. I can't say that I saw it come out of an engine, no. I wasn't working on it.

Q. Again I want you to testify of your own knowledge and not do what Dr. Jeffries did, what he looked at it, from appearance. What do you know of your own knowledge as to that Kant Skore piston having been broken loose that you saw! A. No. I couldn't say that I took it out myself.

Q. What is that! A. I can't say that I took it out

of the engine myself.

Q. You were there, you saw one of them that was

Droke? A. After it came out.
Q. Well, you saw one of them that was broken, is that right? A. Yes.

Q. Do you know that that had actually been used

in an engine! A. I think it was; I suppose so.

Q. I am asking you whether you know now! A. No.

Q. Did you ever see any other broken aluminum pistons in your life besides this Kant Skore piston! A. Oh. I have seen a few, not many.

Q. Have you ever seen any like Exhibit 1 that were

broken? A. Yes.

Q. Where did you see any of those pistons broken? A. In the Ford laboratory.

Q. In Detroit! A. Not Detroit, Dearborn. Q. What year was that? A. About 1928.

Q. Now, Mr. Richey asked you about a piston that you had tested in a Dorris car. Was that exactly like Exhibit 731 A. It was very similar except the shoes went straight out square on the ends, and not drilled.

Q. And you obtained that from Aluminum Company of America! A. We obtained the casting from

Aluminum Company.

Q. Did you ever try out a piston like that? A. Not

exactly like that, no.

Q. When you say "exactly" what do you mean? A. Oh, size, proportion, this piston.

> Mr. Richey: Referring to Exhibit 73. The Witness: 73.

Q. Your company quit business, then, in 1926, is

that right? A. The fall of 1926-27.

Q. Can you tell me whether you ever tried out any pistons like Exhibit 1, the Ford type piston! A. Well, at that time we had learned to get fair service out of the iron piston, and the Aluminum Company wanted \$800 for a die to try out that piston.

Q. Did you think much of it by looking at it? A. Well, we really expected something better because we knew something of the working of that piston some time before.

Q. Now, Mr. Richey asked you about a Sterling piston that I believe had been submitted to Ford Company. I don't know whether it was identified or not, but will you describe that piston? A. With the Invar in it?

Q. Yes. I believe that is the one. A. Yes.

Q. Will you describe how that piston was constructed? A. Through the second ring groove, crosswise—

Mr. Richey: Perhaps I have one.

(Mr. Richey produces piston and hands same to witness.)

A. (Continued) Through the second ring groove, crosswise the pin, a slot approximately 3/32 x 1-1/2 was broached, and a piece of Invar steel inserted and riveted through a boss at the center of the piston head. This steel insert was then sixed so that it, with a ring concentrically arranged, would exactly fit the bore of the cylinder without appreciable clearance, that is, inside of a thousandths of an inch. The skirt of the piston was oval and tapered let me see you might say a flattened corner, that is, it had a major diameter at the top and bottom crossways of the pin and a minor diameter in line with the pin. The diameter at the bottom of the piston skirt was made anywhere from zero to plus three thousandths larger than the cylinder. That was put in the Ford car and with the polish in the cylinders at that time could be driven at top speed the first mile.

Q. What tests were made at the Ford plant of that

piston! A. It was about June, 1928.

Q. What kind of tests were made, and testify of your own knowledge and not what you heard? A. The first test, we delivered a set of pistons and Mr. Shelldrake had them run, and we were told to come back in a few days to see what happened to them. We came back, and the pistons were badly scuffed on one side only, and after lining the pistons the way they come out of the engine, it proved that they were scuffed between number one and number two and between number three and number four. We naturally asked what was the matter with the cylinder block, and Jimmy Smith, the test engineer, said "Well, you needn't be worried about that, if you knew the fight those pistons put up." That was followed by delivering four more sets of pistons with circumferential difference in diameter, in average diameter

of 12, 10, 9 and 8 thousandths. In a week or so we were

back there again.

Q. Cut that as briefly as you can. A And tried out the first set, which, after three trials, having lost the water through breakage of hose and leakage and possibly going without water, the pistons performed up to the equal of what Ford had and they were taken out and examined and pronounced O.K. That was followed in succession with the other three sets of pistons. The third set was put up to 75 miles an hour within about three miles of the plant, that is the laboratory.

Q. Now, do you know whether Ford ever gave any orders for those pistons to Sterling? A. The Sterling people delivered better than 250,000 of those pistons.

Q. Do you know whether those pistons were in competition with any other piston at that time, I mean, as far as utility was concerned? A. Principally No. 1 piston.

Q. And you say 200,000 were delivered? A. There

were 250,000.

Q. And what happened then? A. Well, Mr. Jend began to demand reduction in price in place of a contract, and meantime Sterling had submitted him two cuts in the price, and they had continued to demand reduction in price, so the Sterling people thought it would be better to withdraw then than drag along until there was nothing in it.

Q. Now, that looks like a steel insert in the piston. What is that made out of? A. It is about 34% nickel

and the balance low carbon steel.

Q. What price is that steel? A. We paid 40¢ a

pound for it at that time.

Q. Did that have anything to do with the price of the piston? A. When the Ford Company figured up that, I believe it figured \$800 a ton, they said they

wouldn't pay that for gold.

Q. And how did that piston stand up in comparison with Exhibit 1, if you know, by any test that you know of? A. Why, we never heard any complaints after the first month or so. We had a little trouble with the rib not holding.

Q. I am asking you how it compared with Exhibit 1?

A. It performed better.

Mr. Bruninga: Will counsel in this case admit that the application for patent on this piston that Mr. Dorris has been talking about is involved in an interference proceeding with an application of Jardine, the applicant of the Jardine patent?

Mr. Bruninga: Will Mr. McCoy admit that he was one of the parties to that interference and he filed an application for patent on subject matter common to the Sterling piston!

Mr. McCoy: I also moved to dissolve, because the subject matter of my application was not shown in your application, and said motion was granted by

the Patent Office.

Mr. Bruninga: But Mr. McCoy will admit on account of his being involved in that interference that an application of Mr. Jardine was involved in that interference?

Mr. McCoy: I believe so, on entirely different subject matter from that of either of the other applications, because of the broad scope of the claims

in the parent application.

Mr. Bruninga: Will counsel admit that that interference between Jardine and Flamang and Bowser is still pending in the Patent Office?

Mr. McCoy: I don't know about that.

Mr. Richey: I don't know anything about it. If you say so, I will admit it, subject to correction if we find it wrong.

Mr. Bruninga: I will say that the interference is still pending; it is now awaiting the testimony

Mr. Richey: Why do we clutter up our record with this! I don't think it has anything to do with this case.

fr. Bruninga: You cluttered it up; I am simply

telling the Judge what the facts are.

Mr. Richey: Nothing about this interference. I move all these comments about this interference be stricken out as having nothing to do with the case.

The Master: Overruled. Mr. Bruninga: That is all.

Mr. Richey: I offer in evidence as Plaintiffs' Exhibit 80 the Sterling piston that Mr. Dorris has used in his description of the steel strut piston that he employed.

Mr. Bruninga: I want to make a statement. I want it to appear from the record that Mr. Richey has produced that piston and handed it to Mr. Dor-

ris.

Mr. Richey: That is right.

Mr. Bruninga: I am not saying it is not a Sterling piston, but I haven't examined it carefully enough that I can admit it.

RE-GROSS EXAMINATION by Mr. Richey.

Q. Were you at the Sterling Products when a piston of this type was sent out? A. Yes.

Q. First? A. No.

Q. What test did Ford apply to this piston to your

knowledge! A. Dynamometer and road.

Q. How extensive were the road tests? A. Why, I was in the plant off and on an average of one day a week for some time, and they were running several sets, which of course I didn't know where they went or to what extent they were driven.

Q. They were in test cars being run substantially constant for a week or more at least? A. I understood

80.

Q. And did they thereafter continue the tests on other sets of these pistons of the same nature before they adopted them? A. There was five sets altogether that went in for tests that I know of.

Q. How long was it from the time they were first submitted to Ford to the time they were adopted? A.

Oh, not more than 30 days.

Q. I mean adopted for production! A. About 30

days.

Q. Now, the fact is that this piston, as you say, was tested out by Ford in this manner and then adopted for production purposes, but the first cars that they were put in were those that were sold in the neighborhood of the Dearborn plant, weren't they? A. Yes.

Q. A lot of the things you testified about in your direct examination were things you had been told, weren't they? A. I rode in the machine and was in on

all those tests.

Q. The tests at the Ford? A. Except the first test.

Q. At the Ford plant? A. At the Ford plant.

Q. You were in the car and rode in the test? A. Yes.

Q. So you knew they were tested over a great many miles, don't you? A. Oh, we would put in 150 miles a day on some of those cars at top speed.

Q. Well, isn't it a fact that during your examination a lot of things you testified to were things that you

had heard? A. There might have been a few.

Q. Now, about this piston 80, the fact is that Ford adopted this to a limited extent—250,000 pistons is a few pistons for the Ford Company, isn't it! A. Yes.

- Q. They adopted a few of them and then used them alongside of pistons like Exhibit 11 A. Yes.
- Q. And then the use of those like Exhibit 80 was discontinued and Ford continued to use those like Exhibit 1? A. Yes, the best I know.
- Q. And this black material in the slot in this Exhibit 80 is carbon deposit, isn't it? A. Yes, shows high temperature.
- Q. Notwithstanding the fact that Ford did discontinue this Exhibit 80 you considered that an excellent piston, didn't you? A. I do.

Mr. Richey: That is all.

Mr. Richey: What about this exhibit? That is offered in evidence as Plaintiffs' Exhibit 79.

The Master: You examined about it, yes. Now, the hearings are concluded except as to the testimony of Mr. Garland.

Mr. Bruninga: Charles Garland.

The Master: And you are to either stipulate that or fix the date when that testimony can be heard later, so that all of this mass of material is in, and if you want to fix a time now when Mr. Garland can be here—

Mr. Richey: We have to have an opportunity to answer anything he had, if it is going to be left open, some of these Gulick witnesses that were strayed, we haven't been able to get, we may find one of them in the meantime.

Mr. Bruninga: I understand this is surrebuttal on my part.

Mr. Richey: We haven't closed our rebuttal case yet.

Mr. Bruninga: You haven't closed your case yet?

Mr. McCoy: I will offer in evidence Plaintiffs' Exhibit 81, the docket entry, journal entry of Gulick vs. The Packard Motor Car Company, equity No. 19; Plaintiffs' Exhibit 82 is the Amplex receivership statement of February 6, 1914; Plaintiffs' Exhibit 83 is the Amplex receivership journal entry, September term.

(It was thereupon agreed by and between counsel and the Master that adjournment would be taken to Monday, April 10th, at 9:30 A. M., for the taking of the testimony previously referred to; that plaintiffs' brief shall be filed on Monday the 24th of April, 1933; that defendants shall file their brief two weeks thereafter, and that ten days shall be allowed plaintiffs to file reply brief, after which a time for oral argument would be set.)

By Mr. Richey: We were informed prior to April 10, 1933 by Mr. Brunings that Mr. Charles Garland, whom the defendants expected to call as a witness on April 10, died prior to that date and we accept Mr. Bruninga's statement as correct; and, further, that that is the reason Mr. Garland has not been called by defendants,

Plaintiff offers in evidence as Plaintiffs' Exhibit 84 the judgment of the Law Examiner in Interference No. 49,576 handed down by him on April 4, 1924.

Plaintiff offers in evidence as Plaintiffs' Exhibit 85 a certified copy of the drawings of the Ray E. Day application for patent, Serial No. 611,698 filed on January 10, 1923.

By Mr. Bruninga: Defendants offer in evidence as Defendants' Exhibit 5-M a list of patents issued to Packard Motor Car Company on applications filed between August 1, 1917 and December 1, 1917.

The plaintiff closes its rebuttal case.

The defendants close their surrebuttal case. The case is submitted.

REPORT OF WILLIAM B. WOODS, SPECIAL WASTER.

(Filed January 27, 1934.) [Case No. 4045.]

To the Honorable Paul Jones, S. H. West and Geo. P. Hahn, Judges of the District Court of the United States, for the Northern District of Ohio, Eastern Division:

Pursuant to orders made and entered in each of these causes on September 14, 1932, at a term of this court held in the City of Cleveland, said District, the undersigned, Wm. B. Woods, Special Master in Chancery, has proceeded to take and hear the evidence offered by the respective parties and to report his findings of fact and conclusions of law thereon, along with his recommendations concerning the relief demanded and concerning the final disposition of these causes, to this court; therefore,

I, Wm. B. Woods, as Special Master in said causes, do respectfully report that I have proceeded to investigate the matters so referred to me; that I have been attended by the parties and their respective counsel at my office at 1214 Terminal Tower Building, Cleveland, Ohio; that pursuant to said order I proceeded to hear witnesses and counsel, to receive and consider testimony, affidavits, exhibits, and other proofs heretofore filed herein, to examine and consider pleadings, proofs, briefs, arguments and any and all other matters relating to the questions involved or the issues raised in these causes; that I have ruled upon the admissibility of evidence and have preserved all evidence offered for final ruling thereon by the court, that I have observed such tests and experiments as the parties performed, and all sessions have been held within this District and Division of this court; and that I have heard and considered all proofs and arguments pertinent to the issues of law and fact in these causes. Such hearings have been had, arguments of counsel have been had, briefs of counsel have been filed, together with suggested findings of fact and conclusions of law, and upon consideration of the same I find and report as follows:

PLEADINGS AND ISSUES.

The three suits were consolidated for hearing before the Master and are heard upon the same evidence by stipulation. The three suits were filed October 17, 1931, and are the conventional patent infringement suits upon five patents, involving questions of title, validity and infringement, and are for an injunction and an accounting.

Plaintiff, The Cleveland Trust Company, is the legal owner of the title to all of the patents in suit except the Maynard patent, as to which it appears to have only a half interest. Chrysler Corporation named as co-plaintiff, is owner of the other half of the Maynard patent and is beyond the jurisdiction of the court, and joined as a party plaintiff without its consent. From the evidence it appears that the Trust Company has an option on Chrysler's interest dated prior to the filing of these suits, so that The Cleveland Trust Company is the only party plaintiff before the court.

Defendants are three local dealers of automobile accessories, who have offered for sale, sold and used the pistons charged to infringe, which were made by the Sterling Products Corporation of St. Louis, Missouri, which company is conducting and paying for the defense of the three suits. The Sterling Products Corporation was named in the Bills of Complaint, but on motion was

dismissed and its name expunged.

Five patents are involved with a total of eightyone claims, of which some fifty two claims are alleged
to be infringed. At the outset, only two devices were
involved, i.e. a Sterling piston and a Ray Day piston,
but as the trial progressed the number of devices claimed
to be involved was increased to seven, five Sterling pistons and two Ray Day pistons. The name of the manufacturer, "Sterling" and "Ray Day" are used for convenience.

The subject matter of the patents "relates to pistons" for internal combustion engines as each patent recites, and the following are the patents upon which plaintiff relies:

No.	Patentes	Granted	Application	Filed
1,815,733 1,763,523 1,655,968	Guliek Jardine Maynard	July 21, 1931 June 10, 1930 Jan. 10, 1928	364,997 434,467	Nov. 30, 1917 Mar. 11, 1920 Jan. 3, 1921
1,256,265	Behintedeknecht Mooers	Feb. 12, 1918 Jan. 3, 1922		July 14, 1917 June 2, 1917

In each cause the pleadings comprise the bill of complaint and the answer, and there are bills of particulars and several stipulations filed in each cause.

None of the patents in suit have been adjudicated by a District Court, although the applications, particu-

larly of the Gulick patent, have been interference in the Patent Office. A consent decree was also entered in one

case involving the Gulick patent.

The Cleveland Trust Company, as trustee, has granted licenses under the patents in suit and pistons involving the inventions of these patents have been made, sold and used in large quantities. A great part of the pistons sold are claimed to be actual or substantial duplicates of the pistons of the Maynard patent. Large sums in royalties have been paid to the trustee under the patents, and these causes seem to be the first real test of the patents.

As was said by Mr. Justice Bradley in Railway Co. v. Saules, 97 U. S. 554 (1878) at p. 556: "The evidence in the case is very voluminous, especially in reference to the question of priority of invention, and would be well calculated to present questions of much embarrass-

ment upon the validity of the patent."

Of a similar situation in the recent aluminum molding case where there were also five patents with 29 claims involved, while here 51 claims of five patents are urged to be infringed, in Aluminum Company of America v. Sterling Products, 66 F. (2d) 958 (1933), the Court of Appeals of the 8th Circuit affirmed the Eastern District Court of Missouri and quoted Judge Faris, the trial judge of the District Court, who had said: "The confusing and unnecessary verbosity and prolixity of the patents, the wide range of defenses, the size of the record and the length of the briefs have rendered the case unnecessarily difficult and confusing."

PISTONS, SUBJECT MATTER OF THE SUIT.

The inventions relate to pistons for internal combustion engines. These should be as light as possible and in accordance with accepted construction, pistons are hollow cylinders, closed at one end and open at the other, a connecting rod being secured interiorly by means of a transverse pin. Bearings for the pin are the bosses which project inwardly from the side walls of the piston. The objects of the inventions are to provide a piston which will not expand against the cylinder wall to such an extent as to seize or stick, and at the same time there must be provision for Inbrication. A successful and offcient piston is one which prevents the pumping of oil and the freezing due to excessive expansion.

In the present state of the art, pistons are constructed with the head or the cylindrical ring portion having a relatively large clearance with reference to the diameter of the cylinder and a skirt portion more closely fitting the same, which holds the piston in proper alignment and prevents slapping. Pistons must also be so constructed that the oil cannot creep past the skirt and drop back into the cylinder, which results in the formation of carbon.

The difficulty to be overcome is to get a proper fit, for if the piston is of sufficient size to fit the cylinder properly while at maximum temperature, gas and oil will leak by when the piston is cool, as at the starting of the engine. There is also the problem of providing a piston of minimum weight with maximum structural strength.

Large numbers of the pistons are in constant use in automobiles, and one piston is required for each cylinder. Formerly cast iron piston, were generally used and there was little difficulty because of expansion. With the advent of aluminum, making possible a lighter weight piston, a new problem was introduced because of the difference in the coefficients of expansion.

CLAIMS OF PATENTS CHARGED TO BE INFRINGED.

The plaintiff selects to exemplify the inventions of the patents and as the basis of the charge of infringement some 52 claims, so many that the setting of them out in full is omitted. The claims of each patent as applicable to each piston exhibit are of the following claim numbers:

Exhibit CCC (Defendants') Chevrolet "4" Piston.

Guliek Patent, Claims 1, 13, 15, 18, 22, 27, 28, 29, 30, 33, 35, 36, 37, 38, 41, 42 and 43.

Jardine Patent Claims 1, 8 and 10.

Maynard Patent, Claim 6.

Mooers Patent, Claims 3, 4 and 11.

Exhibit BBB (Defendants') Chevrolet "6" Piston.

Gulick Patent, Claims 1, 13, 15, 18, 22, 27, 28, 29, 30, 33, 35, 36, 37, 38, 41, 42 and 43.

Jardine Patent Claims 1, 8 and 10.

Maynard Patent, Claim 6.

Mooers Patent, Claims 1, 2, 3, 4, 6, 10 and 11.

Eshibit 1 (Plaintiff's) Sterling Piston.

Guliek Patent, Claims 1, 11, 12, 13, 15, 18, 30, 33, 35, 38, 41, 42 and 43.

Jardine Patent, Claims 1, 2, 4, 5, 6, 7, 8, 9, 10 and 11, Maynard Patent, Claims 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 and 11.

Mooers Patent, Claims 1, 2, 6 and 10. Schmiedeknecht, Claims 1 and 3.

Exhibit 3-J (Defendants') Ford "8" Piston.

Gulick Patent, Claims 1, 4, 15, 25, 28, 33, 34, 36, 42 and 43.

Exhibit 3-0 (Defendants') Plymouth Piston.

Gulick Patent, Claims 1, 4, 15, 25, 33, 36, 42 and 43, Mooers Patent, Claims 3, 4 and 11.

Exhibit 8 (Plaintella) Ray Day Piston, Split.

Gulick Patent, Claims I, 15, 22, 27, 28, 29, 30, 33, 36, 37, 38, 42 and 43.

Jardine Patent, Claim 1.

Mooers Patent, Claims 3, 4, 8 and 11.

Exhibit 9 (Plaintiff's) Ray Day Piston, Unsplit.

Mocers Patent, Claims 3, 4, 8 and 11.

FINDINGS OF FACT.

- (1) That The Cleveland Trust Company, plaintiff, is and was at the time the suits were brought, a corporation of and a citizen and resident of the State of Ohio, having its principal place of business at Cleveland, Ohio, in this District, as alleged in the Bill of Complaint.
- (2) That Chrysler Corporation, plaintiff, is and was at the time the suits were brought, a corporation of and a citizen and resident of the State of Michigan, having its principal place of business at Detroit, Michigan, as alleged in the Bill of Complaint, and is not now and was not, at the time suit was brought, within the jurisdiction of this court.
- (3) That Sterling Products Corporation is a Missouri corporation, a non-resident of this District and has not been served with process in any of the above-entitled causes, and that the naming of Sterling Products Corporation has heretofore been stricken from the Bills herein by order of this District Court.

(4) That The Schriber Schroth Company, defendant in Case No. 4045, is and was at the time the suits were brought, a corporation of and a citizen and resident of the State of Ohio and it has and had a regular and established place of business at Cleveland, Ohio, as alleged in the Bill of Complaint.

(5) That The Aberdeen Motor Supply Company, defendant in Case No. 4046, is and was at the time the suits were brought, a corporation of and a citizen and resident of the State of Ohio and it has and had a regular and established place of business at Cleveland, Ohio, as alleged in the Bill of Complaint.

(6). That The F. E. Bowe Sales Company, defendant in Case No. 4047, is and was at the time the suits were brought, a corporation of and a citizen and resident of the State of Ohio, and it has and had a regular and established place of business at Akron, Ohio, as alleged in the Bill of Complaint!

(7) That Sterling Products Corporation was named a defendant in the Bill of Complaint in each of the suifs here combined but it has filed no answers; however, its counsel did petition to appear specially to object to any jurisdiction over it in any of these cases, which leave was granted heretofore by the District Court.

(8) That there is no evidence in these causes showing that Sterling Products Corporation has entered its appearance in any of them; or that Sterling Products Corporation controlled the proceedings in these causes to the exclusion of any or all of the defendants, The Schriber-Schroth Co., The Aderdeen Motor Supply Co., or The F. E. Rowe Sales Co.; but that the respective defendants named herein have controlled the proceedings in these causes.

(9) That The Aluminum Company of America has been granted a non-exclusive license under the patents in suit; Bohn Aluminum & Brass Corporation has been granted a non-exclusive license under the patents in suit; and Aluminum Industries, Inc., (formerly The Kant-Skore Piston Company) has been granted a non-exclusive license under the patents in suit.

(10) That Chrysler Corporation holds title to an undivided one-half interest in the Maynard patent in suit and was requested to join in suits as a party plaintiff against Sterling Products Corporation or its customers, and refused, but was not asked to join in any of these particular suits.

- (11) That the piston of the Guliek patent embodies the fundamental structure of the Franquist patent. No. 1,153,902 and that the piston of the Franquist patent is operative to substantially compensate for expansion; that the piston of the Guliek patent employs essentially the webs of the Spillman & Mooers patent 1,092,870 and of the Chenard & Walcker French patent 468,595 and that the piston of the Spillman & Mooers and of the Chenard & Walcker patents are operative; that the web construction of the Guliek patent differentiates from those of Spillman & Mooers and Chenard & Walcker simply in matter of design involving mechanical skill; and that splitting of the skirts of the Franquist, Spillman & Mooers and Chenard & Walcker patents by through slotting was within the purview of one skilled in the art.
- (12) That by admissions of plaintiff's witness, Gulick, Gulick abandoned and had in public use in this country during the year 1911, a piston exemplified by Ex. 48, and during the year 1914, a piston exemplified by Ex. 51; and that by admission of plaintiff's counsel, both pistons embody the subject matter of claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 42 and 43 and Ex. 51 additionally of claim 38.

(13) That the subject matter of claims in issue in addition to claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 38, 42 and 43 differentiates from the Gunek 1911 and 1914 pistons by matters involving mechanical skill.

(14) That the Guliek specification while pending in the Patent Office was broadened beyond the original disclosure while pistons were produced, used and sold by the following parties:

Gustave C. Monckmeier Walter L. Schoengarth Albert L. Spillman Kant-Skore Mfg. Co. Steven D. Hartog Frank Jardine
Aluminum Company of
America
Howard E. Maynard
Maxwell Motor Co.
Ray Day

William E. Venner

(15) That after the filing of the Gulick application, his application was materially modified, both as to the specification and claims without warrant therefor in the original disclosure.

- (16) That the Gulick patent does not describe in sufficient detail to enable one skilled in the art to reproduce the same, the length and thickness of the webs required to secure flexibility.
- (17) That the Jardine patent embodies the fundamental structure of Franquist patent No. 1,153,902, that it employs essentially the slipper piston structure of the Ricardo patent No. 1,294,833, and that the splitting of the slippers of the Ricardo patent was within the purview of one skilled in the art.
- (18) That the Jardine patent piston differs from the piston of the Long patent 1,872,772 in matters involving mere mechanical skill.
- (19) That the Jardine patent piston differs from the piston of the Gulick patent in matters involving mere mechanical skill.
- (20) That the Jardine patent does not describe in sufficient idetail to enable one skilled in the art to reproduce the same, the length and thickness of the webs required to secure flexibility.
- (21) The Maynard patent embodies the fundamental structure of the Franquist patent No. 1,153,902, and that the splitting of the skirt by through and through slotting was within the purview of one skilled in the art.
- (22) That the Maynard patent piston differs from the piston of the Jardine patent 1,763,523 in matters involving mere mechanical skill.
- (23) That the Maynard patent piston differs from the piston of the Long patent 1,395,441 in matters involving mere mechanical skill.
- (24) That the Maynard patent piston differs from the piston of the Gulick patent in matters involving mere mechanical skill.
- (25) That the Maynard patent piston differs from the piston of the Schmiedeknecht patent in matters involving mere mechanical skill.
- (26) That the Maynard patent piston differs from the piston of the Ricardo patent 1,294,883 in matters involving mere mechanical skill.
- (27) That the Maynard patent piston differs from the piston of the Hives patent 140,998 in matters involving mere mechanical skill.
- (28) That the Mooers patent embodies the fundamental structure of the Franquist patent No. 1,153,902,

and that the employment of narrow connectors was within the purview of one skilled in the art.

- (29) That the Mooers patent piston differs from the piston of the Spillman & Mooers patent No. 1,092,870, in suit in matters involving mere mechanical skill.
- (30) That the Mooers patent piston differs from the piston of the Chenard & Walcker patent No. 468,595 in matters involving mere mechanical skill.
- (31) That the Mooers patent piston differs from the piston of the Gulick 1911 and 1914 pistons (Exs. 48 and 51) in matters involving mere mechanical skill.
- (32) That after the filing of the Mooers application, his application was materially modified both as to specification and claims without warrant therefor in the original disclosure.
- (33) That the Schmiedeknecht patent involves the fundamental structure of the Franquist patent No. 1,153,902 or of any trunk piston; that it employs essentially the construction and arrangement of webs and mounting of wrist pin bosses of the Pugh British patent 17,256 of 1907 and the arrangement of the webs of the Ferry British patent 12,772 of 1914; and that the construction of the Schmiedeknecht patent differs from those of Pugh and Ferry patents and from a trunk piston in matters of design involving mere mechanical skill.
- (34) That by admissions of plaintiff's witness Gulick he conceived a piston like Exhibit 51 in 1908, but that nothing was done except making sketches until May 1911; that a set of pistons having the construction and mode of operation of Ex. 48 was given a block test in a motorcycle engine in this country in May 1911 and then scrapped; that another set like Ex. 48 was given another block test in an automobile engine for 24 hours in July 1911 and scrapped; that another set of pistons like Ex. 48 was placed in an automobile engine in July 1911 and the engine operated to run in the pistons; that the engine with those pistons was then placed in an automobile belonging to his company and given a road test in July and August, 1911 and that the pistons operated successfully; that thereafter the automobile was used with those pistons in it from July to November, 1911, and scrapped; that each of these tests satisfied Gulick as to the utility of the mode of slotting of those pistons; and that Gulick alleged in his preliminary statement before the Patent Office that the road test in July and

August 1911 was one in which the pistons in said engine were first successfully operated. That no further experimenting was done by Gulick with pistons until May 1914 when he proceeded with the preparation of drawings of a construction like that shown in the application and in July with the construction of the piston of aluminum like Ex. 51; that such piston like Ex. 51 was not given a block test for the reason given by Gulick that he was satisfied with the previous tests as to the success of the slotting: that a set of these pistons like Ex. 51 was placed in an Amplex car, his own property, and the car driven by himself over 5,000 miles from July 16, to November 11. 1914, when the pistons were taken out and permitted to go into the scrap pile and disposed of but that Gulick made no serious effort to regain these pistons. That the test of the 1911 and 1914 pistons was not concealed, but known to various parties and that the automobiles in which they were placed were used like any other automobile, the 1911 car for business of his company and in his own business and in the 1914 car for his

personal business.

That in 1911 or 1912 he took a drawing like that of the patent to one Offield, a patent lawyer, and left it with him until 1912 or 1913 when he took it to one Pond, another patent lawyer; that Gulick was not financially embarrassed from 1911 to 1917 sufficiently not to make application for a patent but that in 1913 he raised \$600 to put into the Amplex Company and in that period he filed an application on a motor and another application in 1916. That there was no question about the title of the application of the patent in suit being in Gulicko That Packard Motor Company, the intervening titleholder of the application of the patent in suit obtained an option in March, 1916, which was exercised about August, 1917. That neither Gulick nor ackard made any effort to file an application between March, 1916, and November 30, 1917 and that Packard Motor Company. between August 1 and November 16, 1917, filed a number of applications, at least twelve of which were for other than aircraft and motors for aircraft. That no effort was made to place the embodiments of the 1911 and 1914 pistons in the application of the Gulick patent; that no drawing of either was retained; that neither the 1911 nor 1914 pistons were disclosed to Milton Tibbetts, Patent Attorney of Packard Motor Co.: that the 1914 piston did not come to light until November 8, 1922 when Gulick made the sketch, Ex. 33, bearing that date at Cleveland

in preparation for interference and that Guliek did not at that time tell anything about the 1911 piston.

- (35) That the Monckmeier pistons, Exs. 3-V and 3-W, were in use by Gustave C. Monckmeier in this country in his automobile for more than two years prier to the Gulick application for patent; that such pistons embodied a T-slot disposed intermediate the wrist pin bosses with the horisontal of the T below the bottom ring land and with the vertical of the T intermediate the bosses; that such T-slotting functioned to compensate for expansion; that any reduction in head diameter to the horizontal slot involved mere mecha ical skill; that such use of the Monekmeier pistons more than two years prior to the application of the Gulick patent in suit was open and not in secret but known to others and in fact public; and that the testimony of Monckmeier and his corroborating witnesses is reasonably satisfactory and reliable.
- (36) That for more than two years prior to the application of the patent in smt, Walter L. Schoengarth made and sold at Ironwood, Michigan, pistons of the construction shown and described in the Schoengarth patent 1,174,092 but omitting the adjusting device; that such pistons functioned to compensate for expansion; that any reduction of head diameter to circumferential slot was a matter within the purview of a skilled mechanic; and that the Schoengarth pistons were publicly used and sold in this country more than two years prior to Gulick's application for patent. That for more than two years prior to the application of the patent in suit, Walter L. Schoengarth made and sold at Ironwood, Michigan, pistons of the construction shown and described in the Schoengarth patent 1,174,092. That the testimony of Schoengarth is reasonably corroborated, satisfactory and reliable. That the omission of the adjusting devices is within the purview of any skilled mechanic.
- (37) That one Elmer C. Long, in March, 1916 exhibited to Louis Stellman and William Venner at Syracuse, New York, a six slotted piston of the construction shown by Exs. Y and A respectively. That six slotted pistons of the construction shown in Exhibit A and also in Exhibit F were sold by Long to Venner while Venner was at South Bend, Indiana, as early as 1917, and that during the year, 1917, Venner sold such pistons as replacements in Franklin sutomobiles; and

that Venner continued to sell such pistons furnished him by Long and of the construction shown in Exs. E. F. and G from 1918 to 1926. That a piston of the construction shown in the Long patent 1,395,441 with a T-slot was tested at Franklin Automobile Co., at Syracuse, New York, July, 1918 as admitted by plaintiff's witness, Burns. That during the year 1918, Elmer C. Long manufactured and sold six-slotted pistons of the construction shown in Exs. E. F. G and B for replacement in automobiles and that such pistons were actually used during the year, 1918 in automobiles; that Long continued the manufacture and sale of such pistons during the year 1919, until the latter part of that year when the manufacture of the same for replacement purposes was sold to one Weems in Quincy, Illinois; and that Weems continued the manufacture and sale of pistons of the construction shown in Exs. E, F, G and B from the latter part of 1919 to 1930, and that the manufacture and sale of such pistons was thereafter then continued by Chadwick. That in March, 1919, a piston of the construction shown in Ex. F was tested by Franklin Automobile Company at Syracuse, New York, and that on the same date a royalty agreement was entered into between Long and Franklin; that as early as April, 1920, Franklin Automobile Company actually furnished such pistons (Ex. F) for servicing of automobiles for replacement purposes; that as early as November 11, 1920. Franklin Automobile Company used such pistons like Ex. E in production as standard equipment; and that Long pistons of the construction of Exs. E, F, Wand FFF were used by Franklin. Automobile Company in servicing and regular production until 1926. That the Long pistons of 1917-1926 were successful pistons and from 1917 to 1922 were the only commercial pistons which automatically compensated for expansion. That on January 29, 1920, one Gunn, an engineer of Packard Motor Company, then assignee of the application of the Gulick patent in suit described and illustrated the Long piston in "Automotive Industries" of that date (Ex. D4) and that Packard Motor Company had notice of the Long piston on that date. That as early as July 7, 1921, Weems, then mannfacturing and selling Long pistons of the construction shown in Exs. E. F. G and R advertised such pistons in the "Motor Age" of that date (Ex. U). That as early as December 28, 1921, Elmer C. Long, advertised the Long piston of the construction shown in Ex. FFF in "Motor World" of that date (Ex. 5-C).

- (38) That defendants' pistons, Ex. 1, BBB, CCC, 3-J, 3-O and 8 do not embody the structure, function and mode of operation of the Gulick patent in suit.
- (39) That defendants' pistons, Exs. 1, BBB, CCC and 8 do not embody the structure, function and mode of operation of the Jardine patent in suit.
- (40) That defendants' pistons, Exs. 1, BBB, CCC do not embody the structure, function and mode of operation of the Maynard patent in suit.
- (41) That defendants' pistons, Exs. 1, BBB, CCC, 3-0, 8 and 9 do not embody the structure, function and mode of operation of the Mooers patent in suit.
- (42) That defendants' piston, Ex. 1 does not embody the structure, function and mode of operation of the Schmiedeknecht patent in suit.
- (43) That the Gulick patent in suit describes a piston structure in which flexible webs extend from the wrist pin bosses to the skirt and are surrounded by the skirt; that the prior art requires restriction of the patent to the employment of webs which are of sufficient length and thinness to permit flexing of these webs at the top of the skirt; that Ex. 1 does not employ such characteristic webs; that Ex. 8 does not employ such characteristic webs; and that Exs. BBB, CCC, 3-J and 3-O employ no webs at all.
- (44) That the Jardine patent in suit describes a piston structure in which flexible webs extend from the wrist pin bosses to the slippers; that the prior art requires restriction of the patent to the employment of webs which are of sufficient lengths and thinness to permit flexing of these webs at the top of the skirt; that Ex. 1 does not embody such characteristic webs; and that Exs. BBB and CCC employ no webs at all.
- (45). That the Maynard patent in suit describes a piston structure in which automatic compensation is not secured unless the groove E is cut into the webs F sufficiently and beyond the inside of the piston head flange to secure web extensions at the top of sufficient length and thinness to permit flexing of these web extensions at the top of the skirt; that Ex. 1 does not employ such characteristic webs; and that Exs. BBB and CCC employ no webs at all.
- (46) That the Mooers patent in suit describes a piston structure having narrow connectors of restricted

cross sections extending from the head flange to the top of the kirt; that the prior art requires such a restriction; that in Ers. 1. BBB. CCC. 3-0, 8 and 9 the connectors are heavy and not of a structure as described in the Mooers patent and that in Exs. 8 and 9 the connectors are

from the head to the wrist pin bosses.

(47) That the Schmiddeknecht patent describes a piston structure in which each boss is supported at its ends, with one end of the boss supported from the head and the other end of the boss supported from the web; that the claims in issue are so restricted and must be so restricted by the prior art; and that in Ex. 1 each wrist pin boss is supported intermediate its ends on the web and not as described and claimed in the Schmiedeknecht patent.

(48) That in Ex. 1 automatic compensation is accomplished by what has been termed the "Keystone relief" and not by any web flexibility at the top; that the circumferential slotting terminates at about the inside of the head flange and that such a construction and arrangement does not secure the operation contemplated by the

Gulick, Jardine and Maynard patents.

(49) That Ex. 8 relies upon compensation, particularly at the top by twisting of the connectors from the head to the wrist pin bosses and that such construction and arrangement does not secure the mode of operation contemplated by the Gulick and Jardine patents.

(50) That Exs. BBB, CCC, 3-J and 3-O do not employ any webs connecting the head with the skirt and. therefore, no webs of such flexibility as contemplated by the Gulick, Jardine and even Maynard patents, if the latter has such webs having such characteristics.

(51) That defendants' pistons, Exs. 1, BBB, CCC, 3-J. 3-O. 8 and 9 employ the essential structure, function and mode of operation of the prior art, more particularly the Franquist patent No. 1.153,902 and Exs. 8 and 9, also the Chenard & Walcker French patent No. 468,595.

CONCLUSIONS OF LAW.

(1) That The Cleveland Trust Company holds the entire right, title and interest to all of the patents in suit, except the Maynard patent, and as to this patent it holds an undivided one half of the entire right, title and interest, all as trustee of an expressed trust created by plaintiff's Ex. 26.

- (2) That under Equity Rule 37 The Gleveland Trust Company may sue in its own name without joining with it any of the beneficiaries under the expressed trust created by plaintiff's Ex. 26.
- (3) That at the time suits were brought, the Aluminum Company of America held, and it now holds, a non-exclusive license from The Cleveland Trust Company under all of the patents in suit.
- (4) That the Aluminum Company of America is not a necessary party to these suits.
- (5) That Chrysler Corporation is, and was at the time these suits were brought, an indispensable party to the suits and, being outside the jurisdiction of this court, and having refused to voluntarily join as a party plaintiff, it was properly joined as a co-plaintiff without its consent.
- (6) That this court has jurisdiction of the several defendants in the three suits, viz., The Schriber-Schroth Co., The Aberdeen Motor Supply Co. and The F. E. Rowe Sales Co.

(7) That this court has no jurisdiction of Sterling Products Corporation, a Missouri corporation.

(8) That this court has no jurisdiction nor power to enter any memorandum or declaratory judgment in the above entitled causes that said Sterling Products Corporation is estopped by the doctrine of res adjudicate in any other suit involving the plaintiffs in the above enentitled cause and said Sterling Products Corporation.

(9) That plaintiff, The Cleveland Trust Company, was entitled to acquire the patents in suit.

(10) That by stipulation these three suits were tried together, it being agreed that the evidence adduced in any one of the three causes would be used in any one of the other causes with the same force and effect as if adduced in the cause in which it is used.

(11) That the Gulick patent is invalid and void as to all claims in issue.

(12) That the Gulick patent is invalid and void as to all claims in issue for want of invention.

(13) That the Gulick patent is invalid and void as to claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 38, 42 and 43, because (a) of abandonment—at large—by Gulick and plaintiff and intervening privities in title, and (b) of

public use by Gulick in this country for more than two years prior to his application for patent.

(14) That the Gulick patent is invalid and void as to all claims in issue, additional to those recited in conclusion 13, (a) for want of invention over the pistons abandoned by Gulick and plaintiffs and intervening privities in title for want of invention, and (b) over the pistons in public use by Gulick more than two years prior to his application for patent.

(15) That the Gulick patent is destroyed and invalid in toto, because (a) of the attempt to broaden the original application as against intervening rights, (b) of material changes in the specification and claims after filing, and (c) of failure to describe and claim as required

by R. S. Sec. 4888.

(16) That the Gulick patent is invalid and void as to claims 1, 4, 15, 25, 27, 28, 34, 36, 38, 42 and 43, because (a) the subject matter thereof was in public use in this country by Gustave C. Monckmeier more than two years prior to Gulick's application for patent, and (b) the subject matter thereof was in public use and on sale in this country by Walter L. Schoengarth more than two years prior to Gulick's application for patent.

(17) That the Guliek patent is invalid and void as to all claims in issue additional to those recited in conclusion 16, for want of invention over pistons (a) in public use in this country by Gustave C. Monekmeier more than two years prior to Guliek's application for patent, and (b) in public use and on sale in this country by Walter L. Schoengarth more than two years prior to Guliek's application for patent.

(18) That the Jardine patent is invalid and void

as to all claims in issue.

(19) That the Jardine patent is invalid and void as to all claims in issue for want of invention over the prior art.

(20) That the Jardine patent is invalid as to all claims in issue because of failure to describe and claim as required by R. S. Sec. 4888.

(21) That the Maynard patent is invalid and void as to all claims in issue.

(22) That the Maynard patent is invalid and void as to all claims in issue for want of invention over the prior art.

- (23) That the Maynard patent is invalid as to all claims in issue because of failure to describe and claim as required by R. S. Sec. 4888.
- (24) That the Mooers patent is invalid and void as to all claims in issue.
- (25) That the Mooers patent is invalid and void as to all claims in issue for want of invention over the prior art.
- (26) That the Mooers patent is destroyed and invalid in toto because (a) of the attempt to broaden the original application as against intervening rights, (b) of material changes in the specification and claims after filing, and (c) of failure to describe and claim as required by R. S. Sec. 4888.
- (27) That the Schmiedeknecht patent is invalid and void as to all claims in issue.
- (28) That the Schmiedeknecht patent is invalid and void as to all claims in issue for want of invention over the prior art.
- (29) That the Gulick 1911 piston, Ex. 48 was abandoned to the public by Gulick, plaintiff and intervening privities in title.
- (30) That the Gulick 1914 piston, Ex. 51 was abandoned to the public by Gulick, plaintiff and intervening privities in title.
- (31) That the Guliek 1911 piston, Ex. 48, was in public use in this country by Guliek for more than two years prior to his application for patent.
- (32) That the Guliek 1914 piston, Ex. 51, was in public use in this country by Guliek for more than two years prior to his application for patent.
- (33) That the Monckmeier pistons, Exs. 3-V and 3-W, were in public use in this country for more than two years prior to Gulick's application for patent.
- (34) That the piston disclosure in the Schoengarth patent 1,174,092 was in public use and on sale in this country for more than two years prior to Gulick's application for patent.
- (35) That a piston of the construction disclosed in the Schoengarth patent 1,174,092, but without the adjusting devices, was in public use and on sale in this country for more than two years prior to Gulick's application for patent.

- (36) That the sale and use of pistons and activities in the production and development of pistons by the following parties constitute adverse and intervening rights as against Gulick, plaintiff and intervening privities in title of the Gulick patent in suit, Elmer C. Long, Gustave C. Monckmeier, Walter L. Schoengarth, Albert L. Spillman and Kant-Skore Mfg. Co., Stephen D. Hartog, Frank Jardine and Aluminum Company of America, Howard E. Maynard and Maxwell Motor Co., Ray Day, William E. Venner, W. K. Weems and Charles Chadwick.
- (37) That defendants' pistons, Exs. 1, BBB, CCC, 3-J, 3-O and 8 do not infringe the Guliek patent in suit.

(38) That defendants' pistons, Exs. 1, BBB, CCC, and 8 do not infringe the Jardine patent in suit.

(39) That defendants' ristons, Exs. 1, BBB and CCC do not infringe the May, rd patent in suit.

(40) That defendants' pistons, Exs. 1, BBB, CCC, 3-0, 8 and 9 do not infringe the Mooers patent in suit.

(41) That defendants' piston, Ex. 1, does not infringe the Schmiedeknecht patent in suit.

(42) That prior art not cited in the answer may be used to show want of invention, particularly as to use of expedients.

. (43) That prior art not cited in the answer may be used to restrict claims of patents in suit.

(44) That plaintiff is not entitled to the relief prayed for in the Bills of Complaint, or any part thereof.

(45) That said Bills of Complaint be dismissed.

(46) That defendants have and recover against the plaintiff the costs of suit.

MEMORANDUM.

PARTIES, JURISDICTION, TITLE AND JOINDER.

CHEYSLER CORPORATION AS PARTY PLAUSTIPP.

At the outset defendants raise two questions which concern parties, jurisdiction, title and joinder. In each suit the defense is made (1) that there is a defect of parties, since Chrysler Corporation is a joint owner of the Maynard patent, and (2) that the Aluminum Company of America is a necessary party defendant.

The Bill of Complaint alleges that plaintiff, The Cleveland Trust Company, is the owner of an undivided one-half interest in the Maynard patent, and that the

other one-half is owned by Chrysler Corporation which is beyond the jurisdiction of this court. Plaintiff contends that it has fulfilled the requirements of the law by pleading that Chrysler Corporation has been asked to join in the suit, has refused and is therefore joined as a party plaintiff without its consent. Defendant says that a previous refusal of Chrysler Corporation to join in a suit under the Maynard patent is not justification for a joinder in this case without first having obtained its consent.

Plaintiff relies upon Independent Wireless Telegraph Co. v. Radio Corporation of America, 269 U. S. 459 (1926), which defendant attempts to distinguish on the facts as here presented. The defense is raised in defendants' answers, paragraphs 12 and 23, and is applicable only as to the Maynard patent. The record shows that plaintiff has an option, Ex. B-5, whereby upon payment of \$1.00 the other one half can be secured. No cases have been cited in the Patent Law where a patent owner has attempted to enforce the patent by joining the other co-owner without his consent, although there are many cases in the general law as appears from defendants' citations.

In the Independent Wireless case, Radio Corporation had obtained an exclusive license under the DeForest patents, except for a personal, non-exclusive, non-transferable license in the DeForest Radio Telephone & Telegraph Company, and DeForest also held legal title to the patents. The DeForest Company was asked to join as a party plaintiff and refused, and was thereupon joined by the Radio Corporation without its consent as a party plaintiff. The Supreme Court held that under the circumstances an exclusive licensee was justified in joining the owner of the legal title to the patents without its consent. While Mr. Chief Justice Taft said at p. 468:

party is indispensable not only to give jurisdiction under the patent laws but also, in most cases, to enable the alleged infringer to respond in one action to all claims of infringement for his act, and thus either to defeat all claims in the one action, or by satisfying one adverse decree to bar all subsequent actions,"

and when it came to deciding the case then before the court it was held that the making of the DeForest Com-

pany a party plaintiff was sufficient, for he further said at p. 473:

"The objection by the defendant that the name of the owner of the patent is used as a plaintiff in this suit without authority is met by the obligation the owner is under to allow the use of his name and title to protect all lawful exclusive licensees and sub-licensees against infringers, and by the application of the maxim that equity regards that as done which ought to be done."

Thus, the assignment of the one-half interest from Chrysler Corporation to the plaintiff set up a strong fiduciary relation between the parties as to the Maynard patent, as did the license in the Wireless case and the obligation was on the Chrysler Corporation as co-owner not to defeat the rights which it had agreed to assign or

to detract from them in any way.

The Cleveland Trust Company is here proceeding to protect its licensees and sub-licensees under the onehalf interest in the Maynard patent which has been assigned to it. In Collins v. Hupp Motor Car Corporation, 22 F. (2d) 27 (1927), the Court of Appeals of the 6th Circuit followed the Supreme Court's ruling in Independent Wireless v. Radio Corporation, supra, and Judge Knappen said, pp. 30 and 31, of the legal title of the plaintiff to the patent there in suit "It did not escape being an exclusive license merely because it was for an undivided beneficial interest in the patent, and although limited to the automobile manufacturers' trade," and went on: to say that "Blackmore held the title to the patent in trust for Collins as well as for himself, and upon plainprinciples of equity was under obligation to allow his name to be used in proceedings to redress the joint grievance."

While the rule of Patent Law is that patent monopolies cannot be broken up into several monopolies and all be effective in the same territorial limits, Gayler v. Wilder, 10 Howard 477 (1850), this is not such a case as will warrant denying relief to the plaintiff on this ground.

ALUMINUM COMPANY OF AMERICA AS PARTY PLAINTIPP.

Prior to April, 1924, The Cleveland Trust Company had good title to the Mooers and Guliek patents and at that time gave a license to the Aluminum Company of America to make aluminum pistons under the Mooers

and Galick patents. Plaintiff says that thereby was created a non-exclusive license, so that the Aluminum Company is neither a proper nor an indispensable party to this proceeding. Defendant says that the license to the Aluminum Company was exclusive, being on everything except pistons made entirely of cast iron or steel, and since this case involves aluminum pistons only, it is in effect an exclusive license as pertains to aluminum pistons.

Defendant likewise claims as to the Schmiedeknecht patent which was acquired at a later date, and defendant contends that the plaintiff's title as to the Jardine and Maynard patents is weaker even than that of the Gulick and Mooers patents. As to Jardine and Maynard, defendant claims the Aluminum Company is more than an exclusive licensee, and that under the decisions the plaintiff did not secure legal title to those patents.

Defendant asserts that in April, 1924, by the assignment, Ex. 38-B, paragraph 22, the Aluminum Company agreed to assign to the Trust Company all its patents or applications relating to pistons which it then owned or should acquire, thus including Jardine and one-half interest in Maynard, yet in the same instrument where it agreed to "assign," the Aluminum Company reserved to itself the exclusive license to make, use and

sell aluminum pistons.

There is much argument in the briefs as to whether Alaminum Company of America is an "exclusive" licenses or a "sole" licensee. It is arged upon the authority of the Six Wheel Corp. v. Sterling Motor Truck Corp., 50 F. (2d) 568 (1931), that The Cleveland Trust Company is this case does not even possess a license to grant licenses, the claim being that its title is less than the title found insufficient by the Court of Appeals of the 9th Circuit in the Six Wheel case. Further, the claim is made by defendants that the plaintiff is not entitled to the recoveries of prefits or damages as sought in the Bill and that by failing to join the owner of beneficial interests in the patents plaintiff has lost whatever right it might have to the recovery of profits or damages.

The answer to these contentions is found in Equity Bule 37 which reads in part as follows:

"Every action shall be prosecuted in the name of the real party in interest, but an executor, administrator, guardian, trustee of an express trust, a party with whom or in whose name a contract has been made for the benefit of another, or a party expressly authorized by statute, may sue in his own name without joining with him the party for whose benefit the action is brought * • ...

If the testimony shows that The Cleveland Trust Company is trustee of an express trust and holds title to the patents in suit as part of the trust "property" or estate (pts. Ex. 26), under this Equity Rule the trustee would be entitled to maintain this action in its own name without joining with it the party for whose benefit the action is brought, if the facts warrant such a finding.

Examining the record, it appears that the trust estate consists of 4512½ shares, of which the Aluminum Company of America holds 1100 shares (Tr. Perfler, p. 271). Thus is disposed of in this suit at least, the interesting question as to whether or not The Cleveland Trust Company, in bringing these suits, should have joined the owner of the beneficial interests in the patents. However, The Cleveland Trust Company may be suing either as a trustee of an estate or in its own right. Under the Equity Rule "the trustee of an express trust may see in his own name without joining with him the party for whose benefit the action is brought."

In another case recently heard by the Master, Cleveland Tractor Co. v. International Harvester, Equity No. 3860, a similarly interesting question as to joinder of the licensor and the licensee was raised, and it was there deemed unnecessary to be determined, in view of the other findings in the case. This case presents a different situation because of the trust relationship of the parties, which seems to furnish a sufficient reason for denying defendant's claims that there has been a misjoinder because of failure to make the Aluminum Company of

America a party plaintiff.

VENUE AS TO SPERANG PRODUCTS CORPORATION.

Sterling Products Corporation was named as a defendant in each Bill, and on motion was dismissed therefrom, there being no evidence that Sterling Products Corporation entered its appearance or that Sterling Products Corporation controlled the proceedings to the exclusion of any or all of the defendants. Plaintiff sought to secure jurisdiction of Sterling, apparently to obtain a declaratory judgment affecting Sterling. The Master heard the evidence on the question of its appearance in these causes, and finds that there is no ap-

pearance, and having no power to recommend a declaratory judgment, the evidence on this subject should be expunged from the record as no appearance is made out.

The lituation as to Sterling Products Corporation in this case is controlled by the decision in The Cleveland Trust Co. v. Bimmons Mfg. Co., et al., Equity No. 3510, where the same question was presented, and his Honor, Judge Jones, held that no decree could be entered against Sterling Products Corporation in the entry of March 11, 1932, which was affirmed by the Court of Appeals of the 6th Circuit in 66 F. (2d) 134, on June 29, 1933.

CLAIMS AND DEFENSES.

The first and principal defence is that the pistons made by defendants are in the Public Domain and free and open for the public to use. If this he true, defendants have not infringed any statutory rights of plaintiff. The questions of infringement and validity are interwoven in these saits, notwithstanding plaintiff relied upon 5 patents with 51 claims directed at the 7 necessed devices of defendants.

devices of defendants.

Defendants contend that no claim of any of the patents in suit, however broad it may be can be construed to cover any of the devices; in fact, if any such claim does or can be read upon any of the devices, such claim is invalid as beyond the statutory grant of the patent. Since defendants assert that their pistons are within the Public Demain and they cannot be archited from making them wholly or partly or alling or using them, our first task is to amazine the occased devices.

The evidence offered as to the prior art in this case is to be first considered in examining the distances of the account that distances of the prior art in this case is to be first considered in examining the distances of the account that distances of

The evidence offered as to the prior art in this case is to be first considered in examining the distlanars of the several patents. As to the record, there is little dispute as to dates. The controversy is principally as to what the evidence discloses to "any person skilled in the art or science to which it appertains or to which it is most closely connected." The patent statute (R. S. 4888) uses that expression as applying to the required disclosure as a pre-requisite to a patent grant, and the same applies to the enficiency of any prior patent or printed publication.

The expert witnesses called are Dr. Zay Jeffries, Engineer of The Aluminum Company of America, for plaintiff, and for defendants, Louis M. Stellman, former Engineer of The H. H. Franklin Automobile Company. and George P. Dorris of Dorris Motor Company, all of whom are skilled in the art and whose views are entitled

to weight

Particularly is the history of piston development pertinent in considering these patents for plaintiff's claims of invention are for combinations of old elements alleged to perform a useful function for the first time, Expanded Metal v. Bradford, 214 U. S. 366 (1909); and for which plaintiffs claim that it is no answer to such a patent, to say that any or all of the elements are old. Wisconsin v. Hirschy, 28 F. (20) 838, 841 (8 C. A. 1928).

How this situation as to combinations arises in this case is particularly shown by the plaintiff's claim that the Guliek invention illustrated in the patent employs webs in combination with other patent for the pistons and horizontal and vertical slots; and that flexibility results both in the sections of the thrust face adjacent to the

vertical slots and in the webs.

The plain trunk picton as it existed prior to the pictons in suit is first to be considered. From the evidence it appears that the trunk picton is still used, for General Motors cars use nothing but cast iron trunk pictons and only in trucks use aluminum trunk pictons.

PISTONS CHANGED TO INVENCE.

Defendants' pistons consist of two sets represented by 7 accused devices, viz.: Bet 1, being Em. 1, BBB, CCC, 341 and 3-O, known in this case as the Sterling pistons, and Set 2, being Em. 8 and 9, known in this case as Bay Day pistons.

Bet 1—Sterling Pistons are claimed by defendants to be trunk pistons with the application of such expedients as were long known in the art as applicable to such pistons; that the specific devices had been shown and described in patents and publications prior to the alleged inventions more than two years before the applications of any patent in suit; and which pistons had been shandowed to the public and as to which plaintiff is now estopped to by any claim against the public generally, including these defendants; of these, defendants further assert that

Rehibit CCC is the ordinary trunk piston with the old wrist pin bosses, internal ribs from head to boss, and with reliefs in old circumferential alors, such extending a little over a quarter around the piston, the head is of reduced diameter, which reduction extends below the

lowest ring land as was usual and ancient, to permit oil entrance or exit from the cylinder wall of the interior of the piston; and the skirt is split on one side from bottom to top slot, forming a T-slot in one bearing face which was likewise old.

Exhibit BBB differs from CCC only in that the reliefs in the region of the wrist pin bosses are deeper and cut rather than molded therein, and the circumferential slots are cut in a lathe and not sawed, so that the slots are continued past the old internal ribs from the head to the wrist pin bosses.

Exhibit 1 differs from BBB in that the reliefs have been made still deeper, the sides have been dashed in and made flat, leaving holes at the bottom of the skirt, like happens if a tin can is smashed in; the dashed in formation produced a stiff piston, being a truss construction with a chord spanning an arc, and when this piston scored, resort was had to what is now known as the "Keystone relief."

Exhibit 3-J differs from CCC in that the circumferential slot is in the lowest ring groove.

Exhibit s-O differs from 3-J in that relief is secured by the method of making the skirt oval or elliptical, with a long diameter or a major axis at the thrust faces, and with a short diameter or minor axis along the wrist pin bosses; the circumferential slot is in the lower ring groove only on one side and extending a little over onefourth of the circumference; the vertical slot does not extend to the bottom of the skirt and stops one-third of the way up.

Set 2—Ray Day Pistons are substantially alike except that in Ex. 9 the vertical slot has not been completed but is intended to be by sawing by a mechanic before installation; skirt is supported from the head by lugs, one on each side extending from the head to the boss as shown in the cld Chenard & Walcker patent; except that the piston skirt is not described as split; and flexing is not a necessary factor, for in these Ray Day pistons the skirt is strengthened by a series of annular ribs on the inside.

TRUNK PISTONS AND EXPEDIENTS.

The ordinary trunk piston in use for more than thirty years consists of the piston proper carrying the rings and the cross-head combined in one, so as to pro-

vide what is now called the head and skirt. It has wrist pin bosses projecting from the side walls of the skirt, which are perforated so that a wrist pin may be passed therethrough from which a connecting rod may operate between the bosses. The trunk piston is strengthened interiorly by webs located and formed in various designs. The head carrying the ring grooves was smaller at the ring lands than the skirt, for being the hottest parts, it would expand more than the skirt. The ring grooves receive piston rings now universally split to permit them to expand and contract in order to seal the cylinder, while the skirt itself has a sliding engagement within the cylinder wall.

To this structure of the trunk piston expedients were added before the patents in suit. Relief in the region of the wrist pin bosses was provided for the skirt and this varied in accordance with the conditions encountered or the wish of the designer. The depth of the relief varies from what is necessary in the cast iron piston as shown by the exhibits to the deep relief of the Lynite piston or the extreme relief of the Ferry piston or of the

slipper piston of the Ricardo patent.

Relief has also been obtained by "oval grinding," i.e. by grinding the piston skirt oval throughout the entire length, which practice was shown by exhibits and

noted by the experts.

Another expedient was to run a groove around the skirt just below the lowest ring land to prevent creeping of the oil upwardly past the piston rings, and this groove was perforated to permit the oil to flow through

the piston back into the crank case.

An addition to this last expedient was practiced in the reduction of the diameter of the lower ring land to permit it to wipe the oil down into the groove, thus preventing its passing upwardly into the combustion chamber where it might form earbon. This expedient was shown in the Howe patent and described by Stellman as used by Franklin before any of the patents in suit.

Another expedient, instead of a groove with holes, was the lengthening of the holes to make a more or less continuous slot or slots so that they extended more or less all the way around the shirt. Several prior patents show this, the slot forming a dividing line between the diametrically reduced head and the shirt. In three of the Long patents he reduced the part beneath the lowest ring land to the circumferential slot, and Schoengarth did the same. The circumferential slot isolates the part

below the slot from the part above the slot, which separation Franquist is partial to to about 110 degrees, and in others complete through 360 degrees, while in the Ricardo alipper piaton the alippers are completely isolated from the head.

The uneful function of the slot or insulating gap is to separate the head from the skirt, thus permitting the skirt to run cooler than formerly, and was described as early as 1902 in the Kbbs patent, being repeated in Spillman & Mesers, Chenard & Waleker, and recently in Ricardo. The progressive history of this separation of head from skirt starts with Ebbs 1902, making the connection to the skirt about midway of its length; Spillman & Mooers make the connection at the bottom : Chenard & Walcher through the wrist pin bosses; Franquist at the top by slotting the picton for one half of the circumference; and Ricardo separating the slippers circumferentially from the head by connecting the webs just below the top of the slipper and at the bottom, somewhat above the lower termini of the slippers. The three Long patents make the connection in the first like Franquist and in the second and third like Sbbs and Ricardo. Thus the extent of the separation of head from skirt circumferential and the mode of its connection has varied back and forth from 1902 to 1919.

While the skirt slides in the cylinder, the problem is to conduct the heat from the head, which depends upon the connection or isolation of the head and akirt, and the akirt is subject to expansion. No problem was involved in the use of a cost iron piston since there was no differ-ence in the co-efficients of expansion. With the introduction of aluminum pistons with the high co-efficient of aluminum se compared with cast iron, it was either neces-sary to allow such elegrance as to result in extreme owness and piston slap when the engine was cold, or dit the piston as was done with the piston ring. The difficulty was met in the same way as in piston rings which, when subjected to heat, must still maintain their spring engagement and this was accomplished by wholly

or partially entting through the skirt wall.

Defendants contend that the entire problem was met in the Franquist patent, although the same result is claimed to be shown by the split skirts of Ebbs. Van Bever, Bainforth and Serex. Splitting of the skirt became so common that the Patent Office took the position that this was not invention in any particular piston, and refused a patent therefor (Law Examiner's Decision,

Eirs. 4-C to 4-F). Another expedient in east iron pistons particularly, was to lighten the skirt which was accomplished in several ways, as cutting holes in the skirt or even cutting out a part of the skirt in the region of the wrist pin bosses. The experts noted this practice shown in Spillman & Mocers, Ferry and slipper pistons of White and Ricardo, where the slipper is perforated and even the sides of the skirt cut away.

Defendants contend that these expedients were natural developments within the skill of the calling, and were actually in practice before the advent of the devices of the patents in suit, and the further claim of the defendants is that in the accused devices and even in the structure shown in the patents in suit there is merely an incorporation, more or less, of such expedients in a single trunk piston; and that each expedient performs the same function as it did before the natural production of a better piston. Defendants rely upon such rule followed by the courts, as to a stove in Testeber Hesting Co. v. Burtis, 121 U.S. 286 (1887); a heating stove in Holles v. Von Wormer, 20 Wall. 253 (1873); storage case of Office Specialty Mfg. Co. v. Peston, 174 U.S. 492 (1899); and the concrete mixing and conveying device in Powers-Kennedy v. Concrete Co., 282 U.S. 175 (1930).

THE EXPIRED FRANQUIST PATENT.

The Franquist patent is relied upon by defendants, who claim Franquist gathered everything of the prior art which his claims describe in combination. The specification of this patent is brief, less than two pages, and seems to be the clearest description of conditions encountered, fundamental means to meet those conditions, operation and result, of the many patents and printed publications before the court. Its brevit, and conciseness stand out in contrast with the voluminous specifications of the patents in suit and the professional dissertations of experts.

Defendants claim that the Franquist specification aptly describes the conditions, fundamental means to meet those conditions, operation and result of the Sterling pistons, and that all the patents (except Schmiede-knecht) illustrate the specific Franquist embodiment, so that there is no infringement. The clarity of the Franquist patent No. 1,153,902 is seen in the clauses as to objects and purposes, p. 1, lines 9-25:

"This invention relates to internal combustion engines and has for its primary object the provision of a piston which will eliminate the piston clatter at all speeds and temperatures of the motor.

"With this object in view, the invention consists of a piston having a sleeve which is circumferentially compressible and is adapted to have a snug sliding fit in the cylinder when cold, so that upon an expansion of the piston its sleeve will automatically yield sufficiently to prevent the piston from sticking in the cylinder, and after the cylinder has also expanded will again automatically resume substantially its normal size and take up the free play between the cylinder and piston, which would otherwise occur."

Defendants claim that this language clearly defines the objects and purposes of Sterling pistons and Ray Day pistons, and that in the view of plaintiff's expert it is also true of the Gulick, Jardine and Maynard patents. In the Franquist patent the word "sleeve" is used instead of skirt, to apply to the same part. While brief, the defendant contends the claims of the Franquist patent are fundamental, that they read upon and comprehend all of the accused devices, and that this plaintiff has so heretofore contended as to Ex. 1 in the Simmons case.

Plaintiff relied upon the Franquist patent in the Simmons case, having acquired title thereto on May 16, 1924, when the patent still had some eight years to run. Plaintiff thereafter included the Franquist patent in licenses, Ex. 39-C. List A, and royalties were collected from the various licensees under this Franquist patent.

The piston in question in the Simmons case was a duplicate of Ex. 1 in this case, and it was there claimed to infringe Franquist and other patents in the Simmons case. The Gulick patent issued July 21, 1931, and the interlocutory decree in the Simmons case was entered September 25, 1931, decreeing the validity of the Franquist patent and infringement by duplicate of Ex. 1 in this case, and thereafter followed the injunction on November 5, 1931.

The testimony of plaintiff's expert as to the Franquist piston and its value developed an interesting situation. Dr. Jeffries said, Tr. 207, that he tested the Franquist model piston and discovered it worked no differently than Ex. 1 without a slot, and was a trunk piston.

This discovery by test the Doctor made the day before the decree in the Silimons case was entered, but he did not report this fact to counsel who at the same time were attempting to extend the order of injunction (including Franquist) to Sterling. This effort to include Sterling in that case was denied by the District Court and affirmed in the Court of Appeals. Thus, within two months after the new patent issues to Guliek, notwithstanding a suit is filed charging infringement of Franquist, an order of injunction entered, the expert (and plaintiff must be charged with such knowledge) suddenly discovers that the Franquist patent was nothing at all, although it had been a basis of the decree in the Simmons

Defendants arge that comparison of the Franquist and the Sterling pistons shows identity of structure, function and mode of operation. The claim is that Ex. CCC is only different from Franquist in that there is one slot; that the circumferential slot of Franquist is in the lowest ring groove, while in Ex. CCC it is just below the lowest ring land, but there is no distinction in this because in Ex. 3-J and Ex. 3-O the slots are located as in

Franquist.

Ex. 3-J has the circumferential slotting in the lowest ring groove and in addition has a Keystone relief in the thrust faces forming the so-called Keystone relief not involved in this case, of which more will be said at another place. Ex. 3-O has a circumferential slot in the ring groove; the vertical slot is not completed but terminates one third of the way from the top of the piston, like Franquist in this respect and having equivalent reliefs extending the full length of the skirt in the region of the wrist pin bosses.

The contention of defendants is that the Sterling pistons approach so closely to "ranquist in fundamentals that even in details there is no difference. Whatever difference there is resides in expedients old in the art; the only new thing added being the Keystone relief which is not involved here, and the sole distinction being that instead of one vertical slot, there are four slots or gut-

ters in Franquist.

As to mode of operation, defendants say the Sterling piston is the same as the Franquist, each having a head separated from the skirt in the region of the thrust faces by circumferential slots defining the line of division between a diametrically reduced head, relief in the region of the wrist pin bosses which, upon heating the reliefs compensate for expansion, and with slots closing to compensate for the expansion. Notwithstanding the grant of the Franquist patent, whether expired or unexpired, having all presumptions of validity in its favor, plaintiff's expert asserts that Franquist is an ordinary trunk piston lacking flexibility to function different from a trunk piston, and this in spite of the fact that the specifi-

cation says that the structure is flerible.

Plaintiff points out that Franquist employs four gutters where the patents in suit and the accused devices employ only one slot. Question then arises whether the gutters permit the expansion and contraction of the skirt as does the slotting of the skirt. While Franquist enuses contraction of his piston by what he calls circumferential compression, plaintiff claims that this is not sufficient for successful operation of the Franquist piston, although the testimony lacks the evidence of any motor tests establishing this contention. The application of a can opener device (defendants Ex. 3-1) showed that by pressure of the hand the gutters would be closed sufficiently to hold a coin, which would drop out when the hand pressure was released.

Notwithstanding the pendency of the Simmons suit, the expert testified (Tr. 205) that "the Franquist piston principle so far as I know is not used at all in pistons at the present time," and (Tr. 204) that "the construction of the Maynard piston is different from that of Franquist, its mode of operation is different and its result is different," and this testimony is given at the same time that plaintiff and witness Jeffries claimed that Ex. I and also Exa ERB and CCC employed the Maynard principle. Such contention is at variance with the position taken by plaintiff and those through whom plaintiff claims. By reason thereof, defendants contend that plaintiff is not only estopped by taking these positions against these defendants, but is wholly estopped from questioning the utility of the Franquist piston or that it embodies the structure, function and mode of operation of Ex. 1, as well as of the other accused devices.

ESTOPPEL OF PLAINTIFF TO DENY UTILITY OF FRANQUIST.

Defendants urge that since plaintiff has used the Franquist patent as a basis for this trustee to keep licensees in the fold, and is discovned as it expires, that

thereby arises an equitable estoppel. Having abandoned the expired patent, the plaintiff now seeks to perpetuate its monopoly, relying upon another, the newly insued Gulick patent. Defendants urge that if there is no estoppel, then a third patent might insue after the four-teen years had elapsed, replace Gulick, and the monopoly thus be perpetuated indefinitely. As an answer to such practice defendants urge an equitable estoppel in favor of defendants, a presumption of operativeness and utility of a patent structure conclusive against plaintiff, and that the question is one of utility.

A case in point of like "quite unusual circumstances" is Dalton Adding Mach. Co. v. Rockford Milling Mach. Co., 253: Ped. 189 (DC III., 1918), where plaintiff owned the Helmick patent set up in defense, and marketed machines under that patent, and the court faid:

"The plaintiffs thereby held out the patent to the public as a valid patent, and gave warning to the public and to any possible competitors that they asserted and claimed a monopoly under that patent."

In that case plaintiff brought suit against another for infringement of the Helmick patent, and on issue of the Hopkins patent involved in the then pending case, the suit on the Helmick patent was voluntarily dismissed. Judge Sanborn further said that the facts did not, strictly speaking, there create an equitable estopped in favor of defendants, since they were not in the same business and were not misled by plaintiff's acts, yet the facts did strengthen the presumption of inoperativeness, placing the plaintiff in meonsistent positions.

the plaintiff in moonsistent positions.

In the case at bar, not only are the parties in the same business, but plaintiff was proceeding the Simmons quit, including its claims on Franquist, at the time of the trial in this case. An authority relied upon in the Dalton case, supra, Rice-Stix Dry Goods Co. v. Serven Co., 165 Fed. 639 (C. C. A. 8, 1998), was where plaintiff had sold a structure covered by a Brown patent under trademark and contended the trademark had not expired because the patent was invalid. Judge Hunger cays, p. 645:

the validity of the Brown potent, all the advantages incident to the possession of a valid patent, it will not now be heard to assert the contrary, as a means of escaping consequences arising upon the termination of the monopoly secured through the patent. This is based upon the well-recognized rule that:

'Equity will refuse to aid a complainant in cases of this character, who is himself guilty of making material false statements in connection with the property he seeks to protect.' Hilson v. Foster, 80 Fed. 896.'

And further, p. 646:

"It matters not that complainant may have supposed the Brown patent to have been a valid one."

PRESUMPTION OF OPERATIVENESS.

With the grant of a patent as provided in Revised Statutes 4886, there arises a presumption not only that the patent is valid, but that its structure is practically operative. Otherwise, the grant of a patent by the government would be a vain thing, and there is the further presumption that the expert examiners in the Patent Office have examined the structure for operativeness. Such rule applies to a patent in suit and also to any prior patent advanced as a reference in an infringement suit. Such was the view of Mr. Justice Roberts in Powers Kennedy Co. v. Concrete Co., 282 U. S. 175 (1930), when he said, p. 184:

"Methods and apparatus for moving concrete by compressed air had been previously invented. See Smith's patent, 122,498. The court below, in No. 3, indicated that this had not been found practicable. There is no support in the record for any such finding and against it stands the presumption of operability from its patenting."

To the same effect is Dashiell v. Gresvenor, 162 U. S. 425 (1896) and Dalton v. Bockford, supra.

In view of this presumption, the burden of overcom-

ing it rests upon plaintiff.

UTILITY OPERATIVENESS.

The rule is that a patent structure is not to be considered by its standing alone, but in the light of the art as it existed at the time of the advent of the patent in suit. If the law were otherwise, then one could only copy in detail what is abown and described in the prior patent without using "the skill of the calling" at the time of the advent of the patent in suit. Thus, to determine the operativeness of a patent structure, a skilled mechanic can take the disclosure and supplement it by what

he knows. Walker on Patents, 6th Ed., p. 147, states the rule:

function, though but imperfectly, its utility is not negatived by the fact that it is susceptible of improvement, which will make it operate much better, nor by the fact that some prior invention performed the same function quite as well, or even performed it with superior excellence. Nor is utility negatived by later inventions which are so much superior to the patented process or thing, that they entirely supersocied the use of the latter. Indeed, patents are never held to be void for want of utility, merely because the things covered by them perform their functions but poorly."

A leading case on this is the Bell Telephone case, 126 U. S. 1 (1888), where the patent was attacked because it was alleged to be inoperative, and Mr. Chief Justice

Waite comments on this, p. 536.

The operativeness of an anticipating device, which was disclosed in an engineering publication, and concededly not being commercially practicable, yet it did not lack invention, was held in Sparks Withington Co. v. Joy, 270 Fed. 449 (C. C. A. 6, 1921), where Judge Knappen affirmed Judge Westenhaver of this District, and

said at p. 452:

cannot be pronounced inoperative in a patentable sense, although under many conditions likely to be met it would fail to function, and thus could not be successful commercially. But, testing the disclosure as we think the should by the rules applicable to a patent, the device, as described, did not lack invention merely because the inventor did not successfully bring his art to the highest degree of perfection, nor because, without changes in or additions thereto, it could not be successful commercially."

To the same effect in Universal Rim Co. v. Firestone Steel Products Co., 289 Fed. 884 (1923), opinion also by Judge Westenhayer, and Sun Roy Gas Corporation v. Bellows-Cloude Neon Co., 49 Fed. (2) 886 (C. C. A. 6, 1931), where the contention was made that the Neon tube of the patent did not have a life of 1,000 hours as was required in order to make the structure commercially feasible, and of this, Judge Hickenlooper said, p. 889:

"Conceding that present day competitive conditions require a life of 1,000 hours, that Claude contemplated the use of say 2 mm. pressure, that at this pressure the life of the tube would be much less than 1,000 hours, and that the present great commercial utility of mean tubes is due almost exclusively to the later discovery by some one of the advantages of using pressures as high as 15 mm., or even 20 mm., the argument still falls far short of establishing invalidity. The invention of Claude was the primary one on which all subsequent developments were founded. The test is not that of commercial utility, but rather of operative utility and the forward step."

Plaintiff's answer to this contention is that the Franquist patent was never used commercially, and that the effort to use it commercially failed because it was no better than the trunk type piston so far as commercial fixing was concerned. This is met by the decision of Judge Knappen in Sparke Withington Co. v. Jay, supra, for the argument was there made that by actual test the device was shown to be inoperative and useless. Judge Knappen goes on to point out in the quotation, supra, that a device cannot be pronounced inoperative in a patentable sense, although under many conditions it would fail to function, or could not be used successfully commercially.

Plaintiff also relies on a rule that "broad and less broad claims in patents owned by the same party are infringed by the same structure," citing Byers Mach. Co. v. Keyetone Deiller, 44 F. (2d) 283 (C. C. A. 6, 1990). From the first Syllabus and reading of this case it appears to have concerned a basic patent, and "if valid, it is entitled to a breadth of construction permitted to pioneers in any art." Admittedly, the patents relied upon by plaintiff are not pioneer patents, which clearly dis-

tinguishes the situations.

The burden of overcoming the presumption rests upon plaintiff, and plaintiff offers no convincing test of

the inoperativeness of Franquist.

Plaintiff: is estopped to deny that Franquist advanced the art and to deny that Franquist discloses an operative piston which will automatically yield sufficiently to prevent the piston from sticking in the cylinder

fendants' Ex. 4-A.

while hot and slapping when cold, and is further estopped to deny that Ex. I has the essential structure, function and mode of operation described in the Franquist patent, which likewise applies to Sterling pistons, Exs. BBB CCC, 3 J and 3-0: Holding otherwise would permit the plaintiff to shift its position as its interest required, which is not permitted in a court of equity; to which may be added that plaintiff has not overcome the presumption of operativeness, utility and practicability of the Franquist patent raised by the grant of the patent.

In this connection defendants also urge that there is a misunderstanding as to the function of vertical slotting, that is to say, that the vertical slot in Ex. 1 does not make the skirt of the piston flexible at the top. The same claim is made for the other Sterling pistons. Defendants assert that a structure such as Er I has a skirt which is not flexible at the top, with its dashed in walls attached to the head by additional ribs, both inside and ont. Defendants claim the compensation results from the use of the Keystone relief which is demonstrated in the action of the forces by the vectors, as shown in De-

The claim is that in the Sterling pistons the skirt is tied to the head at the top, and expansion must be and is compensated for by the reliefs in the region of the wrist pin besses which have to be carried into the thrust faces at the top. Defendants claim is that such Keystone relief only made the Maynard piston workable, of which more later. Finally, defendants urge that the Sterling pistons act at the top like the plain trunk pistons with alots, as in the prior art, providing flexibility at the bottom with compensation at the top by the Keystone reliefs. In this it is urged that the Sterling pistons cannot be distinguished from the Franquist which they follow so closely in structure, function and mode of operation. If this be true, then defendants have not invaded the domain of plaintiff's patents, and equitable

ABANDONMENT BY GUIACK OF PRATUERS IN STER LING PISTONS CHAMED TO INTRINGE

relief under the statute should be denied.

The defences of abandonment and public use were raised by the answers, and came into the case with plaintiff's position that the 1911 and 1914 pistons were within the Guliek patent (Tr. p. 935).

Early in the testimony of inventor Guliek it appeared that he made pistons in 1911 and 1914, represented

by Exs. 48 and 51. Upon defendants' insistence that plaintiff should state what Gulick patent claims covered these early pistons, before the case was closed, plaintiff's counsel summers ted certain claims which the two early Gulick pistons showed as exemplifying claims of the Gulick patent, which claims were also infringed by the vari-

ous Sterling pistons.

This presents a question whether the subject matter involved in the 1911 and 1914 pistons was abandoned to the public by the plaintiff or its privies in title prior to the earliest applications of the patents in suit. If abandoned, those pistons are in the public domain and defendants have not infringed the statutory rights of plaintiff by manufacture, wholly or in part, and by sale of any pistons corresponding to those abandoned or deviating therefrom in matters involving merely mechanical skill, which in this case are the obvious expedients of the piston art.

The statutory requirements on the subject of patents pertinent here are R. S. 4896, 4920:

"Any person who has invented any new and useful machine, unless the same is proved to have been abandoned, may obtain a patent therefor

In any action for infringement the defendant may prove on trial (5) that it had been in public use or on sale in this country for more than two years before his application for a patent, or had been abandoned to the public."

These requirements both as to prior use and abandonment must be considered in the light of the facts in the case at har. There are two different issues, one, a statutory bar, and the other, at large on facts to be established; but plainly the latter may be made out on proof directed to what occurred either before or after the bar had fallen.

Plaintiff states that the Sterling pistons infringe from 5 to 9 claims of the Gulick patent embedied in these 1911 and 1914 pistons, so that with the facts which developed at the trial, the issue is made as to whether Gulick abandoned his invention. Gulick testifies that in 1908 he conserved a piston like Ex. 51, the 1914 piston, but he did nothing except make sketches until May, 1911. The 1911 piston (Ex. 48), the head of which Gulick states was dismetrically reduced to the slot, was tested out in May, 1911, by the use of a set of such pistons in a motor-

cycle; they were also given a block test of 4,000 revolutions per minute, and while one broke at the pin boss, there was no seizure; that test established the flexibility

of the piston.

In July a set of such pistons were placed in an Excelsior motor and run for 24 hours; the engine containing these pistons was then placed in a Renault car and driven to the Elgin road races in August, and found satisfactory. In his Preliminary Statement in Interference No. 49,569 (Defendants' Exs. 5F-1 and 5F-2), as to whether the test was a reduction to practice and whether Gulick was satisfied, he says;

"that on or about the 25th day of August, 1911," (date of Elgin road races) "he first explained the invention to others; that he first embodies his invention in a full sized engine, which was completed about the 25th day of August, 1911; and that on the said 25th day of August, 1911, the said engine was first successfully operated, at the City of Chicago,

County of Cook, in the State of Illinois."

The run to Elgin was 150 miles round trip, and the Renault car was driven until November 1, 1911, over 3,000 miles for personal and company business, operating to his satisfaction, and except for methanical repairs the pistons were in perfect condition on November 1st, when they were removed from the car, the car sold with other pistons in it, and pistons like fix 48 were scrapped.

No original drawing of these pistons has been preserved, the only drawing being that of the Gulick original sketch (Ex. 36), and his detail drawing, both showing the detail construction of the application. In the meantime he had taken his piston drawings to various patent attorneys, and took out applications for other patents. Apparently he was so well satisfied with the 1911 test that when he made the Ex. 51, the 1914 piston, it was at once placed in his own Amplex car which was driven anywhere from 2,500 to 5,300 miles from July 16th to November 11th, the car being used for general purposes by him and for the company with which he was then connected. He testified that the pistons gave perfect satisfaction, and on November 11, 1914, were removed from the car at the Amplex plant and later sold with other junk when the plant was sold in receivership.

No skatch of the 1914 piston has been preserved except we have the piston construction of the application which Gulick says was his idea of the proper design.

Guliek did nothing with his piston until in August, 4917, when it was turned over to the Packard Motor Car Company with other so called inventions for which he had given an option to Packard in March, 1916. Packard didnothing with this piston until an application was filed November 30, 1917, although Packard had taken out many other applications since acquiring the option in March of the previous year.

Defendants contend that the 1911 and 1914 pistons were theroughly abundoned. There is no evidence to

were theroughly abandoned. There is no evidence to corroborate Gallick of any communication to the Packard counsel, Tibbetta about these 1911 and 1914 piatons. The 1911 and 1914 piatons do not appear in his application, which illustrates and describes only the web piaton of the Gallick 1911 shotch and the 1914 drawing, and there is no other evidence that they ever were tried out or had any communical history. The 1911 and 1914 piatons do not even appear in historidayit of December 2, 1921 (Ex. 4 L. p. 1950-1960), but again what appears is the drawing of the application construction (Ex. 32), and the affidavit states, referring to the bineprint like Ex. 32:

"that a shotoprint of each blue print is attached hereto; that the longhand notes on said blue print which show in the photoprint were made by him on the blue print prior to the month of October 1915; that said invention was incorporated in an automo-bile engine and successfully operated in the United States prior to the month of October 1915."

There is no evidence that such a pisten was ever guide, let alone tested; and the date of October, 1915, carries back of the fling date of the Schoongarth patent. Any help in the way of correspondence between parties that could be obtained as to the relations between Gulick, the inventor, and the Packard Company, his assignee, the Packard Company a beneficiary of this plaintiff trust, was denied as counsel stood upon their rights as to privileged communications.

The 1914 piston first comes to light on November 8, 1922, when finish made the sketch (Rr. 33) bearing that cate at Cleveland, in preparation of the Interference. He says he did not tell anyone about the 1911 piston "be-

cause he was not asked."

In this situation the following statement in the recent Teapet Dome case, 275 U. B. 13 (1927), by Mr. Justice Batler, is quite in point, and this authority was

again cited by Mr. Justice Cardon in Cooper v. Dasher, 54 Sup. Ct. Repr. of November 15, 1933, at p. 7:

Familiar rules govern the consideration of the evidence. As said by Lord Mansfield in Blatch v. Archer, Cowper 63, 65: It is certainly a maxim that all evidence is to be weighed according to the proof which it was in the power of one side to have produced, and in the power of the other to have contradieted."

Considering Gulick's testimony as to differences between the 1911 piston and the 1914 piston, his personal views appeared as to what design will satisfy the engineer, overlooking the fact that in 1914 he marely redesigned the 1911 piston for aluminum use, put in two webs instead of one, ran the horizontal slot all the way

around, and made the vertical slot nearly straight.

Gulick's activities and the chronological history of the discovery of his device and of his piaton patent ex-

tending over twenty-three years are unique:

1908: Conception like Ex. 51, the 1914 piston (Tr.

p. 742).

1911: May, Motorcycle piston given block test and Gulick was thoroughly satisfied with it (Tr. p. 733); July Excelsior automobile picton given a block test, to the full satisfaction of Gulick (Tr. pp. 745-8), and Excel-sior motor with pictons like Ex. 48 given a run-in test (Tr. p. 707); August, Engine with the run-in pistons placed in Remailt car and given a road test to Elgin, for 150 miles; ran perfectly to Gulick's satisfaction; which was the reduction to practice alleged in his Preliminary Statement (Tr. p. 815); November, after use of these pistons in the Bennilt car for the difference between 2500 to 4000 miles and 150 miles, using the ear for personal use and for company business (Tr. p. 732), the pistons were allowed to go to the scrap heap.

ordered; July, aluminum piston made, not given a block test; had in his personal car and run for over 5,000 miles; thereafter, pistons were let go to the scrap heap (Tr. pp.

734, 739-42)

1916: March, Gulick gives option on pisten to Pack-

ard with other devices.

1917: August, assignment to Packard Motor exe-cuted, and November 30th patent application filed. 1922: September 12th, amending application filed broadening claims and introducing flexibility; and on November 8th made sketch Er. 33 of 1914 piston,

1 1922 1981: Interference proceedings with Long,

1301: April further amendments and patent issued

July 21st

The testimony of Gulick first given at this trial showed that the pistons of 1911 and 1914, as to fitting and results, ran perfectly (Tr. p. 706), and apparently a clear case of actual and statutory abandonment was made out not dely for 1911 use but repeated in 1914. After receas, upon the following day witness Gulick showed a surprising knowledge of experimental use, and his testimony became an about face and an argument that the 1914 pistons were nothing but an experimental use as contemplated by the law; and he cought to limit his previous testimony by asying that the pistons "only operated satisfactorily as far as the split skir! "In was concerned." (Tr. pp. 756-6).

corned. (Tr. pp. 755-6).

The quantien presented is one of abandoussent, i.e. at large or statutory, both of which are covered by the statute R. S. 4886. Walker on Patente, 6th Ed., Vol. 1, in Chapter VII, under the general subject, discusses statutory abandoussent as constructive abandoussent. The policy of the law was early hid down by Mr. Justice Storey in Persock & Sellers of Dialogue, 2 Peters, 27 U.S. 1 (1929), where the court considers the then patent statute from the standpoint of abandoussent, and says.

n. 16:

"It has not been, and indeed cannot be denied, that an inventor may abandon his invention, and surrender or delibrate it to the public. This incheste right, thus once gone, cannot afterwards be resumed at his pleasure; for, where gifts are once made to the public in this way, they become absolute. Thus, if a man dedicates a way, or other canement to the public, it is supposed to carry with it a permanent right of user."

Courts approve a reasonable delay in the filing of an application when the completion of the invention and the testing of its values "by a series of sufficient and practical experiments is necessary," Kendall v. Wissor, 21 How. 322 (1859), and that abandonment may show "either by express declaration or by conduct equally significant with language." The rule is stated in Pitts v. Hall, 2 Blatchf. 235, by Mr. Justice Nelson, that the patentee may forfeit his right "if he use it publicly him-

self in the ordinary way of a public use of a machine at any time prior to two years before he makes his application for a patent."

The leading case is Consolidated Proit Jar Co. v. Wright, 94 U. S. 92 (1876), which sites this rule, where was involved the defence of abundament as well as prior public use and sale. After having unde about two dozen fruit jare, Mason left one of them with the mannfacturer and mover called for it, so that it was said at auction and this neglect for some eight years "is full of significance and has an important bearing open the question of abundament;" and Mr. Justice Swayne said, p. 96:

"It is enough to eny," facts, that in our je ment to the public i Inventors are a m ity, a ant for an limition. A test for erty as a pat same four by the sau ate what I If he falls to do th threation og discovery, nor is lost to him, and is bescole if he had never bean It is made, thereupon, as it were by ocably a part of the domain white community at large. The invention is within this category."

The case most relied upon by plaintiff to negative abandonment is Elizabeth v. Percent Co., 97 U. S. 126 (1877), where the court says, p. 134:

"An abandonment of an invention to the public may be evinced by the conduct of the inventor at any time, even within the two years named in the law. The effect of the law is, that no such consequence will necessarily follow from the invention being in public use or on sale, with the inventor's consent and allowance, at any time within two years before

his application; but that, if the invention is in public use or on sale prior to that time, it will be conclusive evidence of abandonment, and the patent will be void."

An inventor was testing the durability of his pavement over a period of years, and it was held that this was not a public use so long as the inventor was engaged in good faith in testing its operation. There the pavement was laid on a toll road, much used by traffic, and the inventor delayed filing, examining it daily, and while he did not find changes were necessary, the court said "yet he may justly be said to be using his machine only

by way of experiment."

Light on this question of abandonment is to be had in the two cases of Macbeth-Evens Glass Co. v. General Electric Co., 281 Fed. 183 (this District, 1916), which was, a case involving the secret use of a process before applying for a patient thereon. The decision below was by the late Justice Clarks, and was affirmed in 246 Fed. 695 (C. C. A. 6, 1917), Judge Warrington writing the opinion. The court points out that the question of shandsupport is one of fact and one of relinquishment and one of relinquishment and considers the situation analogical statement. of a right to a patent, and considers the situation analogous to what is involved here, where instead of continuing the practice of the invention in secret, the subject-matter thereof "is cost away or destroyed." The court considered the failure of the patent statutes to prescribe a period within which a petent must be applied for. In that once the inventor of a process for making glass need it in secret for markgri0 years, selling the product. At the end of that fime, when the secret was betrayed by an amplayed, the inventor applied for a patent and the court held that the policy of the patent law to secure the full benefit of inventions would be defeated if an inventor could withhold his invention from the public for an indefinite time, for his own profit, keep it a trade secret, and then have the right to secure protection under the patent laws. The remoning of the Court of Appeals of the 6th Circuit was approved by Mr. Chief Justice Tuft in Woodbridge v. United States, 263 U.S. 50 (1923), to the effect that the purpose and the result of the conduct of the inventor was unduly to postpone the time when the public could enjoy the free use of the invention. In this last case the Chief Justice spoke of the unconscionable postponement of the end of the inventor's monopoly (there 10 years) as the result of the inventor's "deliberate design."

Abpost the identical situation as is here arose in Allinson Mfg. Co. v. Ideal Filter Co., 21 F. (2d) 22 (C. C. A. 8, 1927). Allinson reduced his gasoline filter (for dry cleaning) to practice in July, 1914, and continued its use until December, 1916, then he dismantled the apparatus, sold it, and went into another business. Later he went back into the cleaning business but did not use his filter, and after seeing another filter about three years later, somewhat in general aspects the same slithough not an infringement of the subsequently issued Allinson patent, he filed his application for the patent in suit. His use was entirely in secret and in his own business, the filter being made out of an old still, so that it was not a commercial device, and the court held this to be an abandonment, relying upon the Murbeth Bouns once, supra, saying that upon the facts it clearly constituted a public use within the purpose and meaning of the statute. Judge Lowis said p. 96:

"Assuming, however, that he had an intention at any time to apply for patent, which was not proven, the conclusion cannot be avoided that he wilfully and negligently postponed his application, and that, too, until after others had become engaged, to his knowledge, in efforts to discover and put in use a machine for clarifying gasoline for clothes

cleaning purposes. " . .

"In the light of the record we think he aban-doned his rights when he dismantled his machine in 1916, went into the moving picture business and manifested no further interest in his invention until he saw Le Vora's machine in February, 1920."

son's inaction and lack of interest be defined as abandomment, willful negligence or cause for forfeiture.

It was conduct in direct opposition to the purpose
and policy of the law under which he might have acquired rights had he been diligent."

As in the Macbeth Evens case, supra, the equitable rule of election applies. Guliek tested the 1911 piston, used it in his car for 3,000 miles, then scrapped it. He permitted the same thing to be done with his 1914 piston, retaining not even a sketch or sample of that piston.

When selling to Packard he did not tell Tibbetts about it and said nothing about the 1911 and 1914 pistons in his application, and did not even raise the question in his supplemental outh of December 2, 1921, but first tells of it on November 2, 1922, thus establishing a situation where the rule of election applies to make a case of abs. lonnent. Packard was bound by Gulick's acts by its own failure, after acquiring the Gulick rights, to make any application before November 30, 1917, and of course plaintiffs are bound by the acts of Gulick and Packard, Comptograph Co. v. Adder Machine Co., 41 App. D. C. 427.

STATUTORY ABANDONMENT.

The fact that a device is not used continuously for two years does not take it out of the statute, the Supreme Court having construed the patent statute as if the word "for" had been emitted, Consolidated Fruit Jar Co. v. Wright, supra. A patent is void because of a public use more than two years before the application, even though the device had been used only on a few occasions or for a short period of time, Thomson v. Lorons Steel Co., 117 Fed. 249 (1902); Lekley v. Nicholas Power Co., 244 Fed. 955 (D. C. N. Y., 1917). There was no concealment of the pistons, for as to the use in the Benault car, Gulick testified that the 1911 Remault car was "used the same as any other car;" and the 1914 Amplex with his aluminum pistons was used for both company and personal business (Tr. pp. 732-737), and people in the shop saw them, so that no such circumstances there are a public use, Smith & Griggs Mfg. Co. v. Sprague, 123 U. S. 249 (1887), where Mr. Justice Mathews says, at p. 254:

"It was a public use in the sense of the statute and within the decisions of this court, inasmuch as it was used by the complainant in the regular conduct of his business by workmen employed by him in its operation, and in the view of such part of the public as chose to resort to his establishment."

That the pistons when in actual operation were inside the cylinders and concealed from view, does not take such use out of the statute. Hall v. MacNeale, 107 U. S. 90 (1882). After the recess Gulick was not so sure that his pistons of 1911 and 1914 were perfectly satisfactory, and on the question that his activities were only what is known to the patent law as an experimental use, the

decision in Bestman v. Mayor, 134 Fed. 844 (C. C. A. 2, 1904), contains a complete discussion of this subject by Judge Coxe on p. 857-9, with the court's summary of the law:

From these authorities we deduce the following propositions, as applicable to the present con-

troversy:

which to experiment for the purpose of perfecting the invention and demonstrating its utility.

Second. The time thus spent, if in good faith, is no part of the two-year statute of limitations.

"Third. The experiments must be made in perfecting the invention as described and shown.

"Fourth. Experiments made in testing parts of the machine not covered by the invention will not have the effect of extending the two-year period.

"Fifth. As soon as the invention is completed, viz.: 'in such a condition that the inventor can apply for a patent for it,' the two-year period begins to run and the application must be made within this period.

"Sixth. The fact that the invention has been improved since its original embodiment does not demonstrate that it was then embryonic or incomplete.

Beventh. When a clear case of prior public use is established the burden is on the inventor to prove by convincing proof that the use was experimental.

This rule has been followed in this Circuit in Jenner v. Bowen, 139 Fed. 556 (1905), where Judge, later Mr. Justice Lurton, referred to Judge Coxe's decision as fully considered and the cases all examined. This later case was followed by Judge Demison in Austin Machinery Co. v. Buckeye Traction Ditcher Co., 13 F. (2d) 697 (C. C. A. 6, 1926), and by Judge Westenhaver in Kerner Incinerator Co. v. Townsend Estates, Inc., 27 F. (2d) 599 (N. D. Ohio, 1926). The use does not escape the statute unless the experimental use is limited to such use as is necessary to determine the ability of the device to perform the function for which it is designed. The inventor is entitled to use or test the device during its development, to an extent to determine its utility or ability to fulfill the function for which it is intended. When the purposes of the test are fulfilled and success indicated, then

the period of experimental use ends, and the statutory 2-year period begins.

The splitting of the piston having proved successful in 1911 could not be made the subject of additional experimental use in 1914, and thereafter be patented as in the Guliek patent without reference to the modification (aluminum) which was made in 1914. The defendants having made a case of public nee, whether by the patentee or another, the burden is then upon the patentee to show. if he can, that the public use was an experimental one. This the plaintiff has failed to do, notwithstanding the belated assertion of inventor Guliek that his 1911 and 1914 uses were experimental only, that being only his descriptive term and does not constitute this an exception to the public use described by the statute. The use may be public although concealed by the nature of the invention itself, as in the corset case, Egbert v. Lopman, 104 U. S. 333 (1881).

Plaintiff relies upon international Telephone v. Kellogg, 171 Fed. 651 (C. C. A. 7, 1909), where Dean had perfected a telephone transmitter and had used it only for determining its efficiency, and this was held to not be a public use, there being no abandonment; also upon Reo Motor Car v. Gear Grinding, 42 F. (2d) 965 (C. C. A. 6, 1930), where there is also an attempt to carry the date back, the inventor was met with a claim of public use, but in this case, as Judge Denison points out at p. 969, the use during all the period was public enough and was in connection with the current sales of the product, but the embodiment of all steps of the combination was not completed and the court concluded that it did not clearly and satisfactorily appear that the effected and completed method was in public use; and also in Kerser Incinerator Co. v. Townsend, supra; the patentee was utill engaged within the 2-year period in modifying and constructing a second device to overcome the difficulties of the original.

Plaintiff urges that mere delay in filing an application on an invention is not abandonment unless some independent inventor intervenes and forestalls the first invention, and relies upon Hanger v. Rouley, 288 Fed. 359 (1924). In that case there was no use of the artificial limb by the patentee from three to six years for periods of four months in each year, before he filed his application, and this was not followed by permitting the limb to be scrapped and leaving the structure entirely out of the application. It would seem that the most that this case decides is that mere delay is not abandonment.

In the case at bar substantial rights intervened before Guliek broadened his claims and brought forward his 1911 and 1914 pistons in 1922. It is true that in the Mason Jar case large interests had grown up in the way of manufacture, but the Supreme Court did hold that the patent was invalid, not only on the ground of public use, but on the ground of shandonment. Counsel fail to distinguish between abandonment and estopped, and if it is believed that there is a conflict between Hanger v. Honeway supra, and the Marbeth France case, supra, whatever may be said of these decisions there is no question but the rule in this Circuit is the law as stated by the later Justice Clarke's decision, affirmed by the Court of Appeals and quoted with approval by the Supreme Court in Woodbridge v. U. Sa suppose.

m Woodbridge v. U. S., supra.

There was no adjudication by the Patent Office on abandonment or public use yet plaintiff arges that the failure of the Patent Office to act is a persuasive or controlling reason in this proceeding, and arges this notwithstanding there is no proof that the abandonment question

was ever before the Patent Office

There is no rule when requires such a holding here, even the rule of comity is hardly applicable. Comity is not a rule of law but one of practice, convenience and expediency, and as Mr. Justice Brown said in a patent case, Mast, Poos & Co. v. Stoors Mfg. Co., 177 U. S. 485 (1899) at p. 489:

'It demands of no one that he shall abdicate his individual judgment but only that deference shall be paid to the judgments of other coordinate in bunals. Clearly it applies only to questions which have been actually decided, and which areas under the same facts.'

And further, in answer to this argument:

"Comity, however, has no application to questions not considered by the price court, or, in patent cases, to alleged anticipating devices which were not laid before that court."

Plaintiff relies upon Gordon v. Welcott, 42 F. (2d)
55 (C. C. A. 6, 1929), which involved an interference proceedings and patentability had been considered in another suit between the same parties. Unlies may have been "thinking of reduction to practice and not a public use."

but as in the Allison v. Ideal Filter case, supra, he made out a public use, and after recess, a case of abandonment; and the Patent Office did not find that Gulick had done "no more than reduce to practice in 1914," for the Patent Office had never passed upon these questions.

If there should be question as to whether Gulick's reduction to use of the 1911 and 1914 pistons was in fact a commercial use, a recent decision gives light on this subject. That the actual construction of the early Gulick pistons in evidence here could not be patented after the falling of the bar of the statutory period, seems elementary, yet such rule has been questioned and was answered in U. S. Blind Stitch Meh. v. Reliable Meh., 67 F. (2d) 327 (C. C. A. 2, 1933). There a heating machine had been claimed in a former application, was rejected by the Patent Examiner and dropped by the inventor. Later another claimed this device and the court held abandonment had occurred more than two years before. Judge Manton said, p. 329: "This constituted a sufficiently clear anticipation by a machine which had been reduced to practice," and cited Corona Cond Tire v. Dovan Corp., 276 U.S. 358 (1928). The question of reduction to practice was considered by the Supreme Court in this case, and Mr. Justice Taft said, p. 384:

"It is a mistake to assume that reduction to use must necessarily be a commercial use. If Kratz discovered and completed, as we are convinced that he did, the first use of D. P. G. as an accelerator in making vulcanized rubber, ". It is not an abandoned experiment because he confines his use of the rubber thus produced to his laboratory or to his lecture room. It is doubtless true that Kratz, by his course in respect to his discovery as to the use of D. P. G., has abandoned any claim as against the public for a patent,"

The court concluded that the first discoverer of the useful accelerator in the vulcanisation of rubber was Dr. Kratz and not Weis; so here, Gulick's testimony established his early reduction to use, and so he could not more than two years thereafter claim discovery. This comment omits any consideration of the reduction to use by Monckmeier or of the later uses by Schoengarth and Long.

There is also great significance in Gulick's testimony about his early use of these pistons to the cause of de-

fendants, for proof on this vital point comes from a hostile witness and gives strength to defendants claims. Of such evidence, Mr. Chief Justice Taft remarked, in Eibel Coal Co. v. Minnesota Paper Co., 261 U. S. 45 (1923), p. 53, it is "a strong case" that is made from the testimony of opposing witnesses.

VALIDITY OF GULICK PATENT IN VIEW OF RIGHTS INTERVENING BEFORE HIS ORIGINAL APPLICA-TION WAS BROADENED.

The Gulick patent was applied for Nevember 30, 1917, and was issued July 21, 1931. There was also his use of the piston in 1911 and 1914. In this 20-year period many things happened in the improvement of pistons, which industry is bound up with the development of permanent molds in piston making, as replacing the old sand mold.

Packard Motor acquired the Guliek option in March, 1916; its assignment of the patent in August, and the patent application was filed November 30, 1917. His 1911 and 1914 pistons were forgotten, or in any event unmentioned until the Guliek amendment of November 12,

1922.

The independent piston manufacturer won in the controversy with the Aluminum Company of America when the Court of Appeals of the 8th Circuit held, in Aluminum Company of America v. Sterling Products, 66 F. (2d) 958 (1933), that there was no infringement in its use of permanent molds to make pistons. Here the distributor defendants urge that the plaintiff, particularly Packard Motor Company, notwithstanding intervening rights of others, so amended the specification and claims as to not only cover what had been in public use and in issued patents, but so as to convert the specification into the very antithesia. The adverse rights intervening relied upon by defendants are the Long pistons used by Franklin dealers as early as 1917, and the Long patent; the Spillman patent of 1919, with the piston marketed by Kant Skore, rights to which were acquired by plaintiff; the Schoengarth patent of 1916; the Monekmeier piston used in his racing ear 1912 to 1916; the Hartog patent of 1920, acquired by plaintiff, and the Jardine and Maynard pistons in use before the radical change in the Gulick specification as amended September 12, 1922.

The file wrapper of the Gulick patent shows his application to describe a specific construction, viz. a piston structure in which the skirt is entirely separated from

the head by a slot extending entirely around the head being connected to the skirt by webs, and the skirt a between those webs. The original specification sup-sized rigidity of the piston, stating one of its object "to rigidly support the platen pin bosses of a plat from the piston walls," and by further stating the of struction provides "an extremely rigid construction tween the piston pin bosses and the skirt." After Hartog patent this wording of the Guick application was changed and added to so us to make it "family rather than "rigid". This followed the Hartog patents. rather than "rigid". This followed the Hartog pe 1,842,022, filed February 16, 1930, and the Long partners also on the market at that time. The Gulick section was amended in October, 1921, to cover the S man structure which was exemplified in the Kant Shore piston, although plaintiff now says that the Spillman patent structure, which it owns, was worthloss. Gulick's counsel further amends in December, 1921; to cover the Schoengarth patent construction, the Long patent 1,396,441 insued two months previously, and Gunn, a Packard engineer, had described the Long piston in "Automotive Industries" of January 29, 1980.

After the Patent Office rejected several claims in

January, 1922, Galick filed an amendment on September 12, 1922, wherein he converts "an extremely rigid connection" between the pisten bosses and the skirt of the piston into a "flexible connection." This apparently is in order to atrike Hartog and also Long whose pistons had been in service for over two years and were described by Packard's engineer two years and a half before. [Hartog, on Pebruary 16, 1920, had filed an application for a piston which for the first time disclosed the utility of connecting a skirt with the head through the medium of faxible webs. [His application went into interference with Pomercy, ewaed by the Ahamimum Company of America, and new patent 1,400,073 owned by plaintiff trustee. The Examiner decided in favor of the A'unipum Company but was reversed by the Board of Appeals on August 20, 1922 (Ex. 5-HB). This date is important for within two weeks thereafter, on September 11th, the Gulick application is assigned by Packard to the plaintiff, and on the next day the amendment is filed in the Putent Office, substantially changing the Gulick application.

The amendment contains claims taken from the Long patent and Hartog Pomercy interference. There is also a claim to cutch the application of the Maynard patent 1,655,968 filed January 3, 1921, now owned by plaintiff, had been in service for over two years and were de-

1,655,968 filed January 3, 1921, now owned by plaintiff,

what by Max-

dilema: the Long he and the office later took the position ation to split the skirt mand & Walcker. The alick which set out the was not bound to the statement. d la the d. In these controversies Gulick

Gulick alked additional amendments and charges Being powerless to disdeled "amother abject of the meenteen n is to ugidly sepaadded "another abject of the invention is to rigidly separate the piston bosses of a piston from the piston walls," the Examiner throught this covered semething the applicant did not have in saind when his case was filed, or at least "which is beyond anything disclosed in his application." Gulick then amended in May, 1931, filing his Supplemental Oath, where it is pointed out that the Patent Office is bound by the higher tribunds, and following this the application was allowed May 16, 1931 and the patent insued in July.

In this citantian distantant page that the Patent

In this situation defendants urgo that the Patent Office was misled, and that after a decision by the courts, Long v. Gulick, 17 F. (2d) 687 (1927), the Patent Office was in a position where it could not refuse to allow the issue of a patent, Hartog v. Long, 47 F. (2d) 369 (1931). Defendants urge the intervening rights of Spillman (Kant Skore) and Hartog; that Maynard (Maxwell) and Jardine (Aluminum Company of America) were purchased; that Long was harased by an interference proceeding and a suit (Ex. 4Z); that Monekmeier had used his pistons in racing cars, and that Schoengarth had made and sold his pistons.

Defendants arge that there has been such manipulation that a Court of Equity should look with disfavor upon plaintiff's application. The leading case relied upon is Railway Company v. Sayles, 97 U. S. 554 (1878). An invention involving a brake system for railways, filed in 1847, laid dormant for five years when it was "considerably modified" and changed after being purchased by Tanner. Reliance was had upon a prior reduction to practice in the fall of 1846, and in the meantime brakes were made by others and had gone into general use. Mr.

Justice Bradley said, p. 563:

"It will be observed that we have given particular attention to the original application, drawings, and models filed in the Patent Office by Thompson and Bachelder. We have deemed it proper to do this, because livthe amended application and model, filed by Tanner five years later, embodied any material addition to or variance from the original, any thing new that was not comprised in that, such addition or variance cannot be sustained on the original application. The law does not permit such enlargements of an original specification, which would interfere with other inventors who have entered the field in the mean time, any more than it does in the case of reissues of patents previously granted. Courts should regard with jealousy and disfavor any attempts to enlarge the scope of an application once filed, or of a patent once granted, the effect of which would be to enable the patentee to appropriate other inventions made prior to such alteration, or to appropriate that which has, in the mean time, gone into public use."

The rule that runs through the authorities seems to be that an amendment of something new will not be permitted. In Webster Electric Co. v. Splitdorf Electrical Co., 264 U. S. 463 (1924); the original application of the

Kane patent was filed in February, 1910, and after prevailing in an interference with Podlesak the claims in suit were also made in an application over five years after the issue of the Podlesak original patent. Mr. Justice Sutherland, speaking for the court says, p. 465:

for the first time presented to the Patent Office, by an amendment to a divisional application eight years and four months after the filing of the original application, five years after the date of the original Podlesak patent, disclosing the subject matter,

And further:

"A comparison of these claims, as set forth in the patent, with the claims in the original application, to say the least, leaves in doubt the question whether they were not so materially enlarged as to preclude their allowance on the original application. Railway Co. v. Sayles, 97 U. S. 554,"

The court then continues, p. 465:

But this aside, the evidence establishes to our satisfaction that Kane did not originally intend to assert these amended claims, because he considered their subject matter one merely of design and not of invention; and the inference is fully warranted that the intention to do so was not entertained prior to 1918."

As to adverse rights established by the issue of the Podlesak patent, the Supreme Court says, p. 465:

"During all of this time their subject matter was disclosed and in general use; and Kane and his assignee, so far as claims 7 and 8 are concerned, simply stood by and awaited developments."

The court discusses and distinguishes decisions in reissue cases and copying of claims in interference cases, and concludes, p. 471:

Our conclusion, therefore, is that in cases involving lanks, equitable estopped or intervening private or public rights, the two-year time limit prima facie applies to divisional applications and can only be avoided by proof of special circumstances justifying a longer delay. In other words, we follow in that respect the analogy furnished by the patent reissue cases."

The recent analogous case is Powers Kouncely Contracting Corp. v. Concrete Mixing & Conceying Co., 282 U.S. 175 (1950), which involved a device for mixing and conveying materials, particularly concrete, in which an air pipe was shown for the purpose of agitating concrete and preventing it from packing. The application was filed in 1907, changes were made in the specification, now claims were added in 1911 and expanded in 1913 by assigning to the air pipe the function of impairing movement of the concrete rather than agitation, so as to inject into the case what Mr. Justice Roberts of the Supreme Court called "a so called sing theory." The change in front appeared thus: the Leake application was filed in the Patent Office nine months after McMichael, the applicant of the patent in suit filed, which applications were thrown into interference; the McMichael interests purchased the Leake applications with the result that both patents were transed, the McMichael in 1915 and the Leake patent in 1917. Mr. Justice Roberts says, p. 185:

And, even if the mode of operation is as claimed, it is to be remembered that Leake in his application of October 7, 1907, uses the same words to describe the operation of his notales as we find McMichael subsequently inserted in his specifications and claims. When this application came into interference with McMichael's, he of course, became familiar with Leake's claims. It is significant that he then amended his claims, almost in the very words of Leake. This of itself destroys the patent. Reil-way Co. v. Sayles, 97 U.S. 554 : General Electric Co. v. Sangamo Electric Co., 174 Fed. 246 : Lopulco Systems, inc. v. Beaucot Co., 24 F. (2d) 510.

Lopulco Systems v. Beanot Co., 24 F. (2d) 510 (C. C. A. 3, 1928), approved by the Supreme Court, involved a method of feeding coal to furnaces, but did not emphasize the so-called "long fame process" for a furnace. More than two years after the filing of the original application and more than two years after a public use, the long fame theory was for the first time injected into the application. The court hild that the process was not suggested by the original disclosure and denied relief on the authority of Raiseag Co. v. Soyles, supra.

Where the original application did not mention the

Where the original application did not mention the possibility of the use of silicates but that feature was added four years after filing, such practice was demied.

in Dwight & Lloyd Sintering Co. v. Greenwealt, 27 F. (2d) 823 (C. C. A. 2, 1928), Judge Learned Hand saying, p. 828:

as even premonitions of the matter added later.
They are straws at which the patentee now eintenes

to extend his invention."

In this Circuit the decisions aftern and carry out the principles amounced in the above decisions. Wagenhorst v. Hydraulic Steel Co., 27 F. (2d) 27 (C. C. A. 8, 1928), was a case where the original specification as filed disclosed a number of embodiments and one of these later was included in a divisional application which merely amplified the original, but did not change any theory of action. No adverse rights were involved for the claims of the original application covered the interfering as well as defendant's device, and Judge Denison distinguishes the authorities; and in Wirebounds Patents Co. v. Saranac Automatic Machinery Corp., 37 F. (2d) 830 (C. C. A. 6, 1930) he also discusses questions of interfering rights which are not applicable to the situation here, although relied upon by plaintiff.

Michigan v. Satherland, 29 F. (2d) 179 (C. C. A. 6, 1928), arged by plaintiffs as anthority for their position, fails to meet the situation presented on the facts here, for as Judge Knappen there said, if amendments to the patent application "only amplify or explain" what was already reasonably indicated to be invention, the patent is not invalidated. Rea Motor Car v. Genr Grinding, supero, also relied upon by plaintiffs, is not continuive, for there was no change except descriptive changes in the claims after the appearance of adverse fights, for

as Judge Denison says, p. 970:

There was no estoppel arising (if it might sometimes so arise) from a failure to claim the broader monopoly until after some competitor has put out a device not reached by the earlier claims. From the beginning to the end of these applications, Ward was constantly seeking a claim which would clearly have covered every one of defendant's different practices."

As to the conduct of inventors and their patent compel when they see concthing about to be used in a competing device which they would then include in their original application, as Gulick was also an inventor of

large experience, the language of Judge Denison in Waocahorst v. Hudraulic Steel, supra, at p. 32 is quite in

point:

"If this conclusion were in doubt, it would be confirmed by Wagenhorst's own conduct. The mechanical advantages of this construction, as just stated, were obvious. Wagenborst was an inventor of large experience in this particular line and was represented by able soliciters. It is not to be doubted that they would have intended to claim every specific invention which they thought present. It did not occur to either of them that the construction shown in Figure 4 involved any invention in this specific respect. It was only when they saw it was about to be used in a competing device, and realised that, if they failed to secure their broader pending claims there would be no infringement, that they concluded there was specific invention in these details of the assembly, and decided to make the specific claim. We think their first conclusion was the right one."

Gulion 1911 and 1914 Pintons not Illustrated OR DESCRIPTION IN THE PARTY.

The 1911 and 1914 pistons produced by Gulick do not appear in his application nor in the affiderit of December 24, 1931, nor in the correspondence of Gulick with Pastard produced at the trial; and the existence of the 1914 piston was first relied upon in the affidavit of November 8, 1922, while the 1911 pisten appeared later. De-fendants arge that such situation, together with the fact that Gulish surapped his 1911 motorcycle block test and Remark our pistons, permitted the 1914 aluminum pis-ton to be surapped, are reasons which establish that the 1911 and 1914 pistons were actually abandoned; and this is in addition to the fact that they were in public use for more than two years before Gulish filed his application.

To answer this, plaintiff arges that it was not necessary for Galisk to preserve his pistens, illustrate them in drawings or describe them in his specification, because those drawings and specifications disclosed Galisk's earliest embediment of this investion for what he considered as preferred, and that he was therefore entitled to build claims covering those 1911 and 1914 pistons upon such descriptions and drawings.

The rule appears to be that after a certain structure is described in specifications and illustrated in drawings, the applicant is not entitled to cover all claims and monopolize every way of securing the same result, for as was said in Electric Signal Co. v. Hall Signal Co., 114 U. S. 87 (1885), where Mr. finatice Matthews said, p. 96:

"But this result or idea is not monopolized by the patent. The thing patented is the particular . means devised by the inventor by which that result is attained, leaving it open to any other inventor to accomplish the same result by other means."

To the same effect is Willett Mfg. Co. v. Root Spring Scraper Co., 55 F. (2d) 858 (C. C. A. 6, 1932), and was followed in Cleveland Tractor Co. v. International Har-

vester, supra.

That a claim cannot be taken by itself, but must have a clear foundation in the specification, is affirmed in Permitti Co. v. Graver Corp., 284 U. S. 52 (1931), where a claim was held invalid because there was no basis to show the construction. The structure of the Gulick application and the patent as shown by the evidence in this case, cannot be said to have been a further improvement upon the 1911 and 1914 pistons, for Gallick was not then entitled to put a preferred embodiment in his application and immediately proceed to cover everything for securing the same result, for the Supresse Court has said

that cannot be messapelized.

The Sterling pisters, particularly Ex. GCC, apparently app

generally used, so that it can always at recture of the Guliek application can be considered an improvement ever the Guliek 1911 and 1914 pictons.

In another view plaintiff everteaks the fact that the Guliek 1911 and 1914 pictons were specific things as distinguished from what is disclosed in the Guliek application and patents. These pictons, after being tried out to Guliek's satisfaction in 1911 and 1914, and plaintiff is here bound by Guliek's statement, were accupped and so thereaghly discurded that they do not appear again until November, 1922, over a year after the long patent of the il November 1922 over a year after the long patent 1,395,441 has issued II would seem that proof of the abandoment of an incheste right caused by restricted by

showing the shandonment of things such as pistons. The reason of such a rule is illustrated by the rule that re-striction of a patent may be established during the prosecution by especiation or amendment of claims, and the leading case is I.T.S. Rubber Co. v. Essex Co., 272 U.S. 427 (1926), referred to hereafter on the question of in-fringement. Defendants urge that this case is only as to a file wrapper estoppal, but the reasoning seems applicable to the situation presented here.

When Guliek abandoned the 1911 and 1914 piston constructions, actually (as well as by public use), he could not thereafter include them by implication in his November 30, 1917 application. He did not include them, and there is no testimony that he ever told Tibbetts, the Pack-ard attorney who bought the application, about them, and Tibbetts did not include them in the application, for as late as December 24, 1921, the drawing of the application was included in Guliek's affidavit.

GULICK PATHNT VALIDITY AS APPECTED BY MATE. BLAL CHANGE IN THE SPECIFICATION.

Defendants urge that the specification as filed was

Defendants urge that the specification as filed was changed to something totally different from the original disclosure. This change was made nearly five years after the filing of the application, after pistons embodying the changed construction had been on the market and in public use for five years before the change was made. The adverse decision in the Hartog-Pomeroy interference seems to have been the moving came for the change.

The original specification states that it "provides an extremely rigid construction." (Ex. 4 L. p. 1839) and five years later the amendment is that the webs or flanges were yielding in character which was featured as a distinction over Spiliman & Movers and Chenard & Waleker. Planibility of the webs is nowhere mentioned in the original claims, directly or indirectly. Plexibility is raised upon by plaintiff to make out infrangement (Tr. pp. 298-9). Defendants urge invalidity of the Gulick patent.

Defendants urge invalidity of the Gulisk patent, claiming such effect of the amendment to the specifica-tions and claims, since flexible construction of the web is there shown for the first time, and further, that the Guliek patent fails to describe in the specification the metes and bounds of the construction having the required flexibility.

While the decisions of the Patent Office in the several piston cases were affirmed by the Courts on appeal, such decisions now appear to have been founded upon a misconception of Revised Statute 4888, as were prior decisions of the Federal Courts which were oversuled by the Supreme Court in the recent Persent Co. v. Green Corp., 284 U. S. 52 (1931). That case involved the lack of disclosure and definition in patent specification and claims as issued. Its decision is based upon a construction of R. S. 4888, which applies to the disclosure and definition in the specification and claims of a patent as filed, as well as to one as issued. Of this statute Mr. Justice Brandeis said, p. 60:

explain the principle of his apparatus and to describe it in such terms that any person skilled in the art to which it apperains may construct and use it after the expiration of the patent, but also to inform the public during the life of the patent of the limits of the monopoly asserted, so that it may be known which features may be safely used or manufactured without a license and which may not."

That case had to do with filter heds, and a question arose if a "free" bed might have been valid, but that sued on was invalid for lack of disclosure as prescribed by R. S. 4888. There was no mention in the specification of either "free" or a "locked" neolite bed, and the court said as the patentee had failed to give in the specification a written description, and had likewise failed particularly to point out and distinctly claim the free soolite bed, as "the part improvement or combination which he claims as his invention or disclosure," that the patent was void.

The court reviewed the previous decisions on that patent, and the attitude of the courts, including the decisions of the 6th Circuit, 13 F. (2d) 454, 37 F. (2d) 385, and said that such views rested upon misconception, con-

cluding, p. 60:

"Moreover, while drawings may be referred to for illustration and may be used as an aid in interpreting the specification or claim, they are of no avail where there is an entire absence of description of the alleged invention or a failure to claim it."

The rule of this case has since been applied by the 6th Circuit Court of Appeals in Bettesderf v. Ohio Steel Foundry, 56 F. (2d) 777 (1932), affirming his Honor, Judge Hahn, of this District. In that case the alleged feature of the patent was the location of journal bosses

of a railway truck, and this had not been set forth in the claims nor described in the specification. The patent was held invalid as within the prior art. To the same effect are the recent cases of Anchor Cop & Closure Corp. v. Linksett, 56 F. (2d) 542 (8 C. C. A., 1932), involving a jelly jar and cap, and Helfrick v. Solo, 59 F. (2d) 525 (7 C. C. A., 1932), where was involved a patent on a cosmetic compact which did not disclose information as to the ratio between knolin and chalk and the court found that the alleged inventor had failed to disclose in his specifications or claims the novelty on which he relied,

and the patent was held invalid.

In view of the statute, neither the specification as filed nor the specification as issued in the case at bar is a compliance therewith. There were no metes and bounds fixed in the Guliek structure, and plaintiff must fail if inherent flexibility is relied upon, as was done in the Patent Office, for both the Spillman & Mooers and the Chenard & Waleker patents meet that issue; and plaintiff having acquiesced in the position of the Patent Office, said that it was within the field of mechanical skill to split the skirts, while the Commissioner seems to have been misled as to the inherent flexibility of the Spillman & Mooers structure as shown by Ex. 3-P, and of the Chenard & Waleker patent as shown by the Ray Day piston.

Plaintiff's counsel rely upon the Supplemental Oath by Gulick as curing any defects in his applications. Such oath is unavailing in the presence of controllerting facts such as are shown in this record, as was said in Staugard

v. Ellis v. Lee v. Howe, 1889 C. D. 243, p. 248:

"The supplemental oath, in cases where it is effective for any purpose, simply enables the applicant to cover and include in his claim such portion of his original disclosure or description as was not embraced in the statement of invention or claim originally presented." It cannot be permitted in any case to justify such a change as would require an alteration in the date of the application as a completed application."

This rule applies in reissue cases where the reissue application must be supported by an oath. Here the fact that the Patent Office allowed the amendment to be filed is not controlling, for someone might have been mistaken, as seems to have been the fact in the proceedings in this case.

MOGERS PATENT VALIDITY AS AFFECTED BY AT-TEMPT TO BROADEN OBIGINAL APPLICATION AND MATERIAL CHANGES IN THE SPECIFICATION.

Defendants urge much the same situation as to the Gulick application is presented as to the Mooers application, where the specification was changed three years after its filing date. Here the attempt was to incorporate the so-called Mooers principle more than two years after the Long piston was on the market, to say nothing of

Kant Skore, Marwell and Jardine.

The Mocers principle is compensation for expansion by mechanical distortion of the skirt, as testified by Dr. Jeffries who would apply it with many ramifications to all Sterling pistons except Rr. 3-J; this was not embodied in the Mooers application as first filed, and first appeared in the amendment to the Mooers specification filed January 4 1921. After the Mooers patent was assigned to the plaintiff this "Mooers principle" of operation was discovered, and in the mountains the Ricardo patent had been granted, the Long pistons had gone into widespread use, and the art had become tamillar with the aligner piston of the Ricardo type (Bz. 3-8) when the application for an amendment of the Mooers application was filed (Def. Ex. 4-L-1, p. 2000). This Mooers principle, therefore, is on the same footing as to the Mooers patent as the flexibility of the Guiliek patent, and the reasons heretofore given for finding the Gullek patent invalid because of the extension of the Gulick disclosure apply equalty to the Mooers patent which is also found to be invalid.

VALIDRY OF PATENTS OVER PRIOR ART.

Having considered defendants' claims that the Franquist patent was a combination including all that was in the prior art, the next step is to consider the five patents in suit in the light of the prior patents and publications, in addition to the Franquist patent.

GULICK PATENT AND PRIOR ART. 1)

The inquiry is as to the standing of the specific Oulick piston shown in the drawing and described in the specification. The Gulick patent structure comprises a head isolated from the skirt by a circumferential gap extending around the piston below the lower ring land, which is accomplished by connectors extending from the head to the skirt and carrying the wrist pin bosses. Such

connectors are attached in Fig. 1 to the skirt at points just below the wrist pin bosses and then down to near the bottom of the skirt, which attachments above that point are marely longitudinal ribs which have no effect on web flexure. (Stellman, Tr. pp. 530-1, Jeffries, Tr. p. 163.) The skirt is slit in the region between the wrist pin bosses and the structure is such that the webs will flex, although the original specification stated (Ex. 4-L, p. 1838) "the above described construction also provides an extremely rigid connection between the wrist pin bosses and the skirt of the piston."

Defendants urge that this specific structure was not patentable to Gulick, regardless of any extension of supposed patent monopoly, to cover the Sterling and Ray.

Day pistons.

Franquist has a disclosure of a piston which is adapted to have a snug, sliding fit in the cylinder when cold, which upon expansion of the piston, automatically yields sufficiently to prevent its sticking in the cylinder; and the partial isolation of the head from the skirt, as accomplished in the Sterling pistons; and thus the sole distinction is that in place of provision for contraction by partially slotting the akirt vertically, in Gulick the vertical slotting is all the way through the skirt, and specifically, there is a single slot midway between the wrist pin bosses and connecting with the vertical slot.

Apparently the placement of the slot exactly in the center was not a criterion as far as the Guliek patent was concerned (Jeffries, Tr. p. 175.) Slotting through piston skirts was not only old, as shown by the Ebbs patent of 1902, the Van Bever, Bainforth and Serex patents of 1912 the Vincent patent of 1913, and the Schoengarth patent of 1915, but there is also a cutting through of the vertical slot in the Long patent of 1918 and 1919, the Spillman patent of 1919, the Hives and Jardine patents of 1920, the Maynard patent of 1921, and the Ray Day application of 1923. In this connection there is the piston ring which is alit through, admittedly ancient by the experts (Jeffries, Tr. pp. 94-6, and Stellman, p. 477), and the ancient use of expansion joints. Stellman considered slotting no particular trick (Tr. pp. 480-1) when he made Ex. B at Franklin in 1916, and he did that when ignorant of the Van Bever patent (Tr. p. 583).

Plaintiff's claim covering a T-slot to a trunk piston was allowed in an interference with claim 10 of the Long patent 1,395,441, which was allowed to Gulick as

claim 13 (Defendants' Ex. 4-F). Thus neither Long nor the Patent Office could dispute its validity, which was afterwards affirmed by the Court of Customs and Patent Appeals. The hands of the Patent Office were thus tied in which is now urged to be an unpatentable subject-matter, and the Patent Office was in no position to controvert

this after the grant of the Long patent.

Considering also the connections from the head to the skirt, the only difference between Gulick and Spillman & Mooers is that the connection in Spillman & Mooers is made at the bottom of the skirt and in Gulick the attachments are along the skirt; and this the Law Examiner held to be no patentable distinction (Defendants' Ex. 4-E). It is urged by plaintiff's counsel that Spillman & Mooers' patent structure has not gone into commercial use, although it is one of the patents relied upon as infringed in the Summers case, supro.

The same situation arises from the Chenard & Walcker patent as the Spillman & Mooers, for the Law Examiner (Ex. 4-C) uses either patent as a basis, and held it involved nothing but mechanical skill to split the

skirt.

As against the Gulick patent, the defendants claim:

(1) That Spillman & Mooers showed the separation of the head from the skirt, which was all that was required in a cast iron piston, and that Spillman & Mooers, before its expiration, was relied upon by plaintiff as

covering the accused device (Ex. 1).

(2) That Franquist contributed the separation of the head from the skirt, slotting the skirt longitudinally to obtain a piston having a snug, sliding fit when cold, which upon expansion of the piston when hot would automatically yield sufficiently to prevent sticking; this patent was also relied upon by plaintiff before its expiration, sned upon and royalties collected.

(3) That the Franquist invention gave a broader idea than the later Galick patent, i.e., in addition to the isolation of the head from the skirt, the head is diametrically reduced to the circumferential clots and the reliefs in the region of the wrist pin bosses extend from bottom to top so as to merge into the diametrical reduction of the head with the clots.

(4) That splittings through the skirt of the piston vertically was practiced from 1902 to 1923, and T-slots came in 1912.

(5) That the decisions of the Patent Office held that it involved nothing but mechanical skill to split the fkirts of Spillman & Mooers and Chenard & Walcher and to arrange the webs as in the Gulick patent.

Gulick claimed rigidity of his piston, yet as Associate Judge Bland said in the patent appeal of Hartog v. Long, 47 F. (2d) 367 (1931), "that Hartog's piston skirt has more flexibility than Gulick's, and that the elements responsible for such flexibility in Hartog differ materially from the elements responsible for it in Guliek cannot be denied." The court denied the Hartog claim on the ground that he sought to read into the count things suggested in the specification, but not embraced within the language of the count. The cort then goes on to say that it seemed clear if the slot of the Gulick piston takes care of expansion, it is by reason of its flexibility, and finally awarded Gulick the claim. The court then concludes that Gulick should be regarded as prior inventor of the subject-matter, if he had the right to make the claim which was not denied in that court. The pertinency of that language here is that in this proceeding there is denial accompanied by proof that Gulick has both abandoned and is not the prior inventor of a piston with a skirt that flexes or yields,

The legal question is thus presented regardless of the decisions in the Patent Office acquisced in by plaintiff, does it involve invention on the part of Gulick to take old pistons such as Spillman & Mooers or Chenard & Walcker and split the skirts of those pistons in the

region of the wrist pin bosses!

INVALIDITY OF LACK OF INVENTION.

Where the patentee had gone to another art to supply an expedient, it was not held to be a departure, and hence not invention. In the present case Gulick stayed in the same art, namely, pistons. In Crown Cork & Seal Co. v. Stering Cork & Seal Co.; 217 Fed. 381 (C. C. A. 5, 1914), was involved a patent for automatically scaling bottles by forcing a cap thereon. A previous patent granted on the same application of the patentee had partially solved the problem, which provided a yielding connection between the Pitman and the plunger engaging the cap to force it on the bottle. That situation corresponds to this, in that the skirt of the Franquist piston is later slotted so as to be permitted to contract when the piston gets hot. In that case the plaintiff relied upon an im-

provement, and the applicant having gone to another art, substituting a yielding arrangement upon the previous patent, and of this Judge Denison says, p. 385:

plaintiff's 1898 patent, viz., that he could go to the yielding plunger art, or to some specific art, and adopt a yielding plunger as an element of a bottle-sealing machine, was a meritorious conception. It may have entitled him to a broad monopoly upon any use of a yielding plunger in that association (as was apparently secured to him by the first claim of his 1898 patent)."

He then continues in discussing the situation before the court, p. 385:

"That question is not before us, and we do not mean to intimate any opinion; but, however that may be, having had this conception on 1898 and having received a patent, he could not have another patent in 1899 which would do more than cover the improvement which he then discovered."

Judge Denison thea states the reason for the unsoundness of such a procedure as follows, p. 385:

Having gone into the yielding plunger art, and adopted and adapted the hydraulic sylinder yielding plunger into and for a bottle scaling machine, and having thus bridged over whatever gap there was between bottle scaling machines and yielding plungers, and having thus incorporated the two arts together, he could not the next year adapt a mechanical trip yielding plunger to bottle scaling machine use and then get a valid patent covering any kind of a mechanical trip yielding plunger when used in a bottle scaling machine. Yet this is, in effect, his present position, and must be his position to succeed. There remained open for his 1899 patent only his adaptation, not his adoption.

He then quotes with approval the decision of Judge Killits in the District Court as follows, p. 385:

"But, when Painter patented the mechanism alleged to be infringed in this case, the art of bottle-sealing by trowns had already invaded the art of yielding pitman, of which the known forms were many, and had made an appropriation therefrom.

Whatever may be the merits of his invention, we find nothing in his great which shots the door of opportunity to some other inventor to go to the yielding plunger art for an old device of this character."

While it is elementary that invention may reside in a combination of elements which were theretofore separately old in the art, in order to sustain such combination the inventor must do more than make a judicious selection from the devices of the prior art. Merely doing this, as said by Judge Hickenlooper in Newcomb, David Co. v. Maken Co., 59 F. (2) 899 (1932) at p. 901, "is the exercise of mechanical skill reasonably to be expected in the development of the art, and has repeatedly been held insufficient to evidence invention, whether such decision be placed upon the ground of aggregation or upon the lack of an exercise of an inventive faculty," citing Concrete Appliances Co. v. Gomery, 269 U. S. 177 (1925). In another decision by Judge Hickenlooper, in Bettendorf Co. v. Ohio Steel Foundry Co., 56 F. (2d) 777 (C. C. A. 6, 1932), the court said, p. 778:

"It would require no exercise of the inventive faculty merely to combine these desirable and well-known elements of the prior art structure—especially under the stimulus of newly adopted standard-imation requirements."

And further, p. 779:

"But, after all is mid and done, there still remains the question of fact whether the patent discloses an emercise of the inventive faculty, in view of the state of the art, or merely mechanism skill; and the question of law, whether the claims properly protect the patentee in the invention which he has really made."

While it is within the province of the court to decide this case on the ground of non-infringement; as was the result in Groun Cork & Seel Co. c. Storling Cork, supra, the facts here seem to warrant going further and helding that the claims on the Gulick patent are invalid as in the last case cited. Other cases to the same effect in this Greenit are Oil Conservation Regimeering Co. v. Breaks Regimeering Co., 52 P. (2d) 783 (1981), Sande Mfg. Co. v. Smith, 53 F. (2d) 459 (1981), and Rham the v. Sparks-Withington Co., 56 F. (2d) 583 (1982)/ The Supreme

Court early so held in a case, Thatcher Heating Co. v. Burtis, 121 U. S. 206 (1987), ignolving the use of the old fuel maguzine in a particular base burner, where Mr. Justice Matthews said, p. 294:

"When this fuel magnine was thus transferred from one kind of store to another, in its new situation it performed precisely the same function, with respect to the fuel and the fire, as it had always been accustomed to perform in its old place""

and this was followed in Thomson Spot Welder Co. v. Ford Motor Co., 265 U. S. 445 (1923), where the Supreme Court approved the language of the Court of Appeals of this Circuit, and said, p. 451:

"Although invention is not necessarily negatived by the fact that each element of the combination is old, the question of fact whether the combination itself involves invention in view of the prior art is always present."

A recent holding of lack of invention appears in Naivette, Inc. v. Bishinger, 61 F. (2d) 433 (1932), where a re-issue of patent to Decker on permanent waving had been held valid and was reversed by the 6th Court of Appeals, Simons, Judge, saying at p. 437:

"We fail to see invention in Decker. He combined old elements, but manifestly in such a way as must have been obvious to anyone skilled in the art, and the combination produced no new result. If what he did marked any improvement in the art, it solved no real problem and answered no recognized need, and such advance, if any, as was achieved was altogether too trivial to rise to the dignity of invention. Beyoner v. Ford Meter Company, 44 F. (2d) 396."

JAMEST PATEST AND PRING ART.

The inquiry is as to whether the specific structure shown in the Jardine patent amounts to investion in view of the prior art. Defendants urge that plaintiff takes another type of piston, a slipper piston as shown in Jardine, being specifically that of the Rieardo patent No. 1,294,833, and upon this would aphold another patent for a split slipper piston.

Testimony at the hearing showed that Jardine is also the basis of Maynard, and that to Jardine Maynard merely added an oil wiping ring at the bottom. The testimony showed that Jardine knew of the Ricardo piston and its development; that it was tried out by the Aluminum Company of America, and plaintiff's expert produced a Ricardo piston on rebuttal. An exemplification of Ricardo piston was shown in the publication of "Automobile Engineer" in 1918 (Ex. 3-8), which piston had been tried out by plaintiff, so that there is no hasis for surprise in this proof which was not pleaded in the answer. Comparison of the Jardine and Ricardo pistons shows that both are slipper pistons, being distinguished in that Jardine split both slippers, which practice was known to the prior art from Ebbs in 1902 to Long in 1919.

The webs of Ricardo are thinned down, which plaintiff claims was already done by Gulick in his patent disclosure. While the webs of Ricardo are thinner than those in the Jardine patent, the difference seems to be one of degree. The isolation of the skirt from the head goes all the way around as in the Spillman & Mooers and Chenard & Walcker patents, and as in Franquist considering the slot as going all the way around as a part passes through the air. The form of the slippers of Jardine are appropriated from Ricardo in making one slipper longer and wider than the other. There was considerable evidence that the Jardine piston is simpler, lighter and cheaper than Gulick, which is due to its being a slipper piston. The statement of plaintiff's expert that Jardine was the first single wall piston to flex overlooks Franquist in view of the tests and the testimony in this record. Jardine pistons were never sold, have never gone into commercial use, although plaintiff's expert says that the Ricardo piston was used in Europe. Plaintiff's claim is that Jardine was followed by Maynard, a better piston, which was developed by Maxwell.

The Jardine piston seems to be invalidated by the Ricardo piston which was known to Jardine when he started to work on it, and the slitting of the slipper piston of Ricardo by plaintiff's assignee, as Guliek had done with the Spillman & Mooers piston, fails to show any inventive effort. The discussion of the authorities in Cross Cork a Seal Co. v. Sterling Cork, supra, and the

cases there cited, are to the same effect.

Before Jardine filed his application, the Long piston was on the market for perhaps three years. Long's application for patent No. 1,872,772 was in interference with Jardine, involving claim 5 of the Long patent, the

decision was adverse to Jardine, so the Jardine patent if valid is valid to cover only the exact invention disclosed, for the Jardine claims relied upon are invalid in view of the Long pistons, the applicable rule of the patent law being that which if later will infringe if earlier will anticipate. The claims of the Jardine patent relied upon are invalid in view of the Long pistons.

MAYNARD PATENT AND PRIOR ART.

This inquiry is as to the standing of the specific Maynard piston shown in the drawing and described in the specification. Besides the patent stating that this invention relates to pistons, Maynard says (p. 1, 1, 2) that the patent "has for its object the prevention of the pumping" of oil and the 'freezing' due to excessive ex-

pansion.

Defendants arge that through Maynard plaintiff is attempting to monopolize the application of the same old split piston with its dashed in relief, with its head diameter reduced, and with an oil groove, all claimed to be old in the art. Defendants are not limited to the dashed in relief, for plaintiff contends that the other Sterling pistons with relief (Exs. BBB and CCC) come within the scope of the Maynard patent.

Maynard admits the employment of the old expedient of longitudinally slotting a piston skirt, in the specification (p. 1, ll. 16 et seq.), and weeld add thereto an oil groove between the piston ring portion and the skirt portion which is called "a continuous annular groove." A smaller recess for the "film of oil around the piston" was described in the Howe patent 908,569, and which use had been followed by licensee of that patent (Tr. pp. 1067-8). The slotting described in the Maynard patent was in quadrants, leaving one half of the groove in the air, and the only language of the patent about the web structure and splitting which is claimed to be equivalent to a relief, is p. 1, ll. 60, et seq., concluding:

"Thus there are formed recesses H surrounding the bearings G with segmental skirt portions on opposite sides thereof and an annular skirt portion below said segmental skirt portions,"

and with reference to function they have stated as follows:

"Any oil accumulating in the recesses H will follow down the webs F and there is no chance at any point for the accumulation of oil adjacent to the rings."

Any reference to flexing of the skirt is emitted from the Mayaard patent. Claim 6 is for a combination of a head, webs, a skirt integral with said webs "relieved adjacent said webs to a point between the bosoes and the end of the skirt," and circumferential and longitudinal slots. The reliefs are not dashed in but are similar to the reliefs of Franquist. Nowhere in the patent is there any statement about Keystone relief, found necessary to make function commercial pistons like Exs. 1 and 17.

The plaintiff's expert testifies that Maynard is a commercially successful piston, combining a number of features (Tr. pp. 77, 121-2). Maynard does combine a number of features, namely, a trunk piston having the expedients of the prior art, to which has been added in practice a Keystone relief not disclosed in the Maynard patent. Defendants claim that without such Keystone relief the Maynard piston is not a commercial success, and the proof offered by plaintiff that the Maynard piston operates successfully without the relief is not convincing.

Maynard was on notice as to what preceded him, for there was the Jardine piston and the Long piston. Plaintiff's expert testifies that after the test of the Jardine piston on a Maxwell car, Maynard being Chief Engineer of the producing company, "this Maynard development came along" and the Maynard piston is the one that was adopted in the car." (Tr. pp. 131-132.) Plaintiff's expert says that Maynard is like Jardine except that the skirt is completed at the bottom and Maynard added the old oil wiping ring (Tr. pp. 77, 137) which was shown in the Schoengarth and Roots British patent, that Maynard went back to Schmiedeknecht, for both Maynard and Schmiedeknecht followed the Ferry British patent, that the Maynard piston is like the Jardine from the boss up, and like Schmiedeknecht from the boss down, and differs from the unslotted Ricardo in that Maynard has a wiping ring at the bottom.

Coming to the operation of the Maynard piston, it appears that the top was not sufficiently flexible to compensate for all expansion, which is secured in the commercial piston (Exs. 1 and 17) by the Keystone relief not shown in the patent. While two rough castings were

that after the filing of the Maynard patent application, change was made to give the Keystone relief (fix. 23). So the piston before the court is the piston of the Maynard patent which is without the Keystone relief. A significant fact is that Chrysler abandoned the use of the Maynard piston although owning a half interest in the Maynard piston (Tr. p. 130). The Franquist piston a complete answer to the Maynard piston, for it shows the structure, function and mode of operation of the Maynard patent, as is the Long patent 1,395,441 which was tested by plaintiff's witness, Burns, at Franklin as early as 1918, and Stellman mys (Tr. p. 525) that all Maynard did was to put the T-slot of Long on the piston of Schmiedeknecht.

Finally it must be said that plaintiff cannot even rely upon an alleged copying of the Maynard piston by defendants, in view of the failure of the patent to disclose an essential feature necessary to make it work, that is, the Keystone relief, for as said by Judge Hickenlooper in Bettendorf v. Ohio Steel Foundry Co., 56 F. (2d) 777 (C. C. A. 6, 1932), at p. 779:

"Clearly if the claims as stated fail to disclose a patentable invention, no license is required, the device may be used and made by anyone."

The Maynard patent represents a collection of old expedients, each employed in the usual capacity, which the courts have consistently refused to recognize as a patentable combination. Similarly, a valve patent was assently held invalid in Central Bruss Mfg. Co. v. Republic Bruss Co., 63 F. (2d) 287 (1933), where Judge Hicks said, reversing His Honor Judge West of this District, p. 289:

"Spaced interior partitions with aligned ports, angular passages, and hollow alerves having lateral ports communicating therewith are all admittedly very old in valves relating to the plumbing art. Bloch was chargeable with knowledge thereof, and we think that the introduction of these elements into his combination was an obvious one. Acting upon his knowledge, skill and experience, he simply took another step in the evolution of the bathtub and shower art. He produced a chesper, more compact, and perhaps a more convenient valve; but we do not think that his achievement was the result of the exercise of the inventive faculty."

Moonine Patrict and Pason Aux.

As to this patent, a similar situation is presented as to the three preceding patents. Plaintiff owns the Spillman & Mooers patent; in fact, the Spillman & Mooers patent was the foundation of the original trust agreement, to which was added this Mooers patent. Under dpillman & Mooers, royalties were collected until its expiration, and it was one of the patents in the suit of Cleveland Trust v. Simmons Mfg. Co., hereinbefore considered. Following the expiration of the Spillman & Mooers patent it is now disowned by plaintiff as be-

ing impractical.

Mooers states in his specification (p. 2, Il. 99 et seq.) that the construction of the piston embodying his improvements may be carried out in permanent molds, which was not true of a construction for the old patent, and that he had in mind the use of permanent molds in the design of his improvement. When the Spillman & Mooers patent was issued in April, 1914, the patent molding process had not been developed, so that with the advent of permanent molds there was a requirement of ready extraction of the core from the mold. Plaintiff's expert admits this particular piston never went into commercial use (Tr. p. 114), that it was not satisfactory (Tr. p. 107), has no skirt flexibility, is inferior to the construction of Gulick and Jardine, and claims for the patent that it discloses relief adjacent to the bosses and permits mechanical distortion and was the first to compensate for heat by distortion.

The Spillman & Mooers patent seems to be a complete answer to this Mooers patent, for Mooers went back to the construction of Franquist by having the connection of the head to the skirt raised and eliminating the attachment made at the bottom of the skirt. This was a compromise between he efficiency of heat transmission and efficiency of operation, and a similar practice was said by the Patent Examiner in the Gulick interference (Ex. 4-E.

pp. 1661-1662) as requiring no inventive effort.

Plaintiff urges that the claim reaches the Ray Day piston for the connection is from the head to the wrist pin boss, and urges that the Ray Day piston thus infringes the Mooers patent. Neither the patents of Spillman & Mooers or the Chenard & Walcker patents show reliefs in the region of the wrist pin bosses, although prior to both, pistons had been relieved in the region of the wrist pin bosses. Relief was accomplished by oval

grinding, as now shown in the Plymouth piston (Ex. 3-0), and which expert Stellman says is described in the Chenard & Walcker patent. So the question arises, if reliefs in the region of the wrist pin bosses by oval grinding was not sufficient, and separation of the head from the skirt was not sufficient, does it constitute invention to use both features in one piston, which seems to be what has happened with the Ray Day piston as regards the Mooers patent.

On the basis of the authorities heretofore cited, such combination cannot be invention, for the next might combine separation of head from skirt with oval grinding and simple relief; another might add a tapering of the skirt, to say nothing of other combinations which might

be offered.

Considering the Sterling piston, the Franquist patent is a complete answer to Mooers, as is the Gulick 1914 piston (Ex. 51), except the two connections inside the piston and the absence of relief opposite the wrist pin bosses, which Gulick carefully said his early piston did not have.

Plaintiff having made reference to the Mooers patent a clear issue in this case, by contending that the accused devices infringe, and from the constructions it appearing that as far as the Mooers patent is concerned the accused devices are in the public domain, the claims of the Mooers patent relied upon as infringed are found to be invalid and void.

SCHMIEDBENECHT AND PRIOR ART.

This patent was acquired by the plaintiff after several transfers from the Bohn Aluminum & Brass Corporation for an interest in the trust estate. Ex. 1 is the only accused device as to this patent. With the advent of aluminum and the consequent difficulty of securing a proper fit, this invention is put forward as a light weight east iron piston, apparently to obviate the difficulties arising from aluminum pistons (p. 1, ls. 35-46).

The specific construction of the patent provides a piston in which the weight is reduced by cutting holes in the side walls, and would replace the previous practice of mounting wrist pin bosses on the side walls by the use of ribs or webs. To obviate the necessity of thickening the walls of the piston, Schmiedeknecht proposes webs on the inside of the piston and supporting the bosses each at one end from the web and at the other end from the head (p. 1, ls. 97-107, p. 2, ls. 4-12).

Ex. I does not employ the Schmiedeknecht construction but supports the wrist pin boss intermediate its end. The construction of Schmiedeknecht is exemplified in the prior art by the Pugh British patent, where each boss is supported at its end from a cross web extending to the head of the piston. Also, the Ferry British patent more nearly approached Ex. 1, for there the bosses are wholly supported by cross-webs.

Here again Ex. 1 follows the prior art more closely than it does the Schmiedeknecht construction. Plaintiff makes the issue by contending that a construction in which the boss is supported intermediate its ends, in the equivalent of a boss supported at the ends, and in view of the prior art, the finding is that the Schmiedeknecht patent is invalid and void.

PRIOR USES.

To establish prior use, defendants offered evidence of pistons made and used by Monckmeier in his racing cars as early as 1911, the pistons made and sold by Schoengarth in 1915, and the pistons made and sold by Long before May, 1916. If established, such prior uses by Monckmeier and Schoengarth constitute a statutory bar against the plaintiff's claim on the Gulick patent. Prior uses as affecting the other patents in suit is also to be considered.

MONORMERA PINTONS.

Defendants offered in evidence proof of the existence of the Monekmeier piston from 1911 to 1916, producing the two pistons involved, a cast iron piston (Ex.
3-D) and an aluminum piston (Ex. 3-W). Monekmeier
is a business man now engaged in the manufacture of
tools and automobile appliances, and when racing Staver
cars, slotted and used the pistons produced at the trial.
Three additional witnesses were called, a mechanic who
did machine work for Monekmeier on the 1911 piston, another now in the automobile repair business, who helped
Monekmeier put the 1915 pistons in his car before the
Eigin race when they were first-used, and another in the
manufacturing business in Chicago, who helped Monekmeier install the aluminum piston in his car in the early
fall of 1914, before the Iowa City race and again saw the
pistons before the Anamosa race of June 10, 1915. These
witnesses were wholly disinterested, none were in the
business of marketing or producing pistons, and by his

own use, Monckmeier is barred of securing any patent

rights.

Monckmeier testified he had the cast from piston in his possession since 1912 after he had slotted it at Peoria, and had the aluminum piston since 1914. Both were used in races of which he testified, and to corroborate, magazines and newspapers were produced, checking the dates and showing that he competed in the races as he had orally testified, in several of which he won prize money.

After the recess plaintiff brought other witnesses who had known Monckmeier and of his racing, and whose testimony varied in details but in no substantial way discredited the facts as to Monckmeier's manufacture and use of the pistons in the races on the dates before established.

lished.

The construction of these old pistons is established by their production and offer in evidence, so there is no question about relying upon oral recollection as to the nature of such construction, such as was considered in the Barbed Wire case, 143 U. S. 275 (1892). In that case the court said that "the proof shall be clear, satisfactory and beyond a reasonable doubt," and recently the Bupreme Court, in Eibel Process case, 261 U. S. 45 (1923), Mr. Chief Justice Taft said, at p. 60, "that the evidence to prove prior discovery must be clear and satisfactory," but in each of these cases no original device was produced. Here not only are produced the original pistons described by three corroborating witnesses, but the dates of use are checked by public documents, newspaper and magazine articles, together with a record of a private contract.

A similar question was presented in Cleveland Tractor v. International Harvester, Equity No. 3960, where the decision of this Master was allersed by his Honor, District Judge Jones, on March 25, 1932. The same authorities there cited are pertinent here, for there was involved a power take-off mechanism which had been used on a tractor in 1910, some three years prior to the application for the Strait putent. What was said in that case is quite in point here, and the following is from pages 37 and 38 of the Master's report:

a prior use in a patent case or the proof of such use by a paroled evidence. The question in each case is one of fact to be decided, whether the evi-

dence which has been produced by the defendants proves the existence of the alleged prior use. If the device is simple, if the witnesses are apparently honest, if the circumstances are such as to have properly impressed the event upon their minds and memory, and particularly if they are familiar with the subject matter of the alleged invention, such prior use may be established by paral evidence. An early case discussing the evidence of prior use and hold a patent invalid is Sipp Electric & Eug. Co. v. Atwood Morrison Co., 142 Fed. 149, where a discussion of such evidence appears at pages 153-5."

"Cases of prior use are summarised and discussed in Haggerty v. Rawlings Mfg. Co., 14 F. (2d) 928; which involved a patent relating to guards or pads for use in football suits. The evidence of prior use was the verbal testimony of four witnesses that it was common custom to make devices similar to the patented invention prior to the application for patent. Other cases, Chrone v. John J. Gibson Co., 247 Fed., 503; Lee v. Upson & Hart Co., 43 Fed. 670; Rochester Coach Lace Co. v. Schaefer, 46 Fed. 190; Groupe Drier & Boiler Co. v. Fiske Geiger, et al., 215 Fed. 110."

"Upon the strength of parol testimony of a prior use a patent for disk plows was held invalid in Linville v. Milberger, 29 F. (2d) 610. As to such use of the implement, Judge McDermott said (p. 617):

but, no one, I believe, can read the evidence of these seventeen persons, with their wealth of homely methods of fixing the dates with checks and bank records supporting the story, with different witnesses identifying one part of the plaw he had fixed and another witness another part and have any vagrant suspicions that they are perjurers. In ahort, the evidence meets the exacting standards required and is supported by the appearance of the plow itself."

This last case was affirmed by the Court of Appeals of the 10th Circuit, 34 F. (2d) 390 (1929), and in the opinion of Judge Phillips repeats with approval the above language as to prior use establishing the defense of invalidity. Plaintiff urges that the pistons of the patents in suit are for use on pleasure cars and that Monekmeier's use on a racing car was simply an experimental use. The Supreme Court did not accept such a view in the famous corset case, Egbert v. Lippmans, 104 U. S. 333 (1881), where only the famous of the inventor had used the device and this was more than two years prior to the application, which the court held to be a use and not

an experiment.

Plaintiff urges that the use by Monckmeier amounted to nothing more than an abandoned experiment; that the Monckmeier use of pistons in 1911 is not to be considered an abandoned experiment is established in Buser v. Novelty Tufting Machine Co., 151 Fed. 478 (6 C. C. A., 1907), where a small tufting machine had been used prior to 1886, was not used in 1886 and 1887 when the 2-year period began to run; the court held that it was immaterial whether it was used until during the eleven year period before the patent was applied for. If once used as a completed invention, that is enough in distinguishing between the public use of the statute and abandoned experiment, Judge Cochrane says, p. 492:

"These two things are entirely distinct, and in argument the distinction between them is not clearly noted. In order that it may be, we will consider them one at a time in relation to said position. An abandoned experiment is an experiment that has been abandoned. As a mere experiment never amounts to anticipation, the epithet abandoned here is unnecessary. What constitutes an experiment is indicated by the language of Mr. Justice Swayne in the case of Coffice v. Ogden, 18 Wall. 120, 21 L. Ed.

821:

The invention or discovery relied on as a defense must have been complete and capable of producing the results sought to be accomplished. If the thing were embryotic or incheate, if it rested in speculation or experiment, if the process pursued for its development had failed to reach the point of consummation, it cannot avail to defeat a patent founded upon a discovery or invention which was completed, while in the other case there was only progress, however near that progress may have been approximated to the end in view. The law requires, not conjecture, but certainty. If the question relate to a machine

as thus exhibited, the conception must have been clothed in substantial forms, which demonstrate at once its practical efficiency and utility.''

And again:

"'Until his work is done, the invention gives nothing to the public.'

"If, however, the machine or other thing is complete, and capable of producing the result sought to be accomplished, it has pessed the experimental stage and becomes an invention; and, in order that it may constitute an anticipation, it is immaterial how well it becomes known or how much it is used."

Where a device was only used for two and one half months this was sufficient "public use" to bar the grant of a putent to another filed more than two years later, Brush v. Gondit, 132 U. S. 39 (1889) where one clamp and lump device had been used in work in a mill at night, in and out of doors. Such use was not experimental, and Mr. Justice Blatchford said, p. 47, it did not seem to be for the purpose of testing the machine, of calling attention to its qualities or of gratifying curiosity, but was used to furnish light to workmen. Here Monckmeier used his piston in a car used to win races, for which he was paid money.

Even a limited use of a device is sufficient to bar a patent, as Judge Tuttle said in Eclipse Interchangeable Counterbore Co. v. Gairing Tool Co., 33 F. (2d) 942 (1929), at p. 943;

lished, was not patented, and the amount that it helped the world, of course, was pretty limited. But so long as I find as I do, beyond a reasonable doubt, that it was done, that it was used, and with mechanical success sufficient to bring it into the art, I am forced to consider it."

Plaintiff also arges that the Monckmeier pintons, constructed and slotted as shown in the exhibits, would not operate to entinfaction in the present day automobile, and of course no piston does that. The piston of the Gulick patent did not, nor would the Gulick 1911 and 1913 pistons, but what was embodied by Monckmeier and by Gulick in the 1911 and 1914 pistons is now open to the public, even if old devices might now seem impracticable.

They must be considered a prior public use of what they actually embody, regardless of their efficiency, if used in this day. The same question was before the Court of Appeals in Motor Improvements, Inc. v. General Motor's Corp., 49 F (2d) 543 (1931), also involving some five patents on purclator or oil filtering devices, where it was established that the old Royal Tourist car used an oil filter which was described as impracticable, still it was a prior use of oil distributing pipes and of undoubted efficiency, which feature Judge Mack held was good and constituted a bar to a subsequent patent on that particular feature. In the same way the T-alot expedient broadly claimed to be covered by the Gulick patent, was used not only by Gulick but by Monckmeier and Schoengarth more than two years before Guliek's application. To the same effect on this point is Eclipse v. Gairing Tool Co., supra, and Kil-Nock v. Chicago Plating Co., 10 F. (2d) 536 (D. C. III 1926), where Judge Lindley says, at p. 538:

When it clearly appears that a prior device is in all essentials the device of the patent, and in fact accomplished practical work and was put to ordinary use, anticipation is made out; though the anticipatory device did not operate as perfectly as that of the patent, and was not long kept in use. Brush v. Condit (1889), 10 S. Ct. 1, 132 U. S. 39, 33 L. Ed. 251; Id. (C. C. 1884) 20 Fed. 826.

Plaintiff urges the precedent of several cases in which the evidence of prior use has been held insufficient and sets up a varieties as to how the proof in this case should be minaured. The authorities offered present not an igniance where the alleged device alleged to have been in use is offered in evidence by the prior user. In United Shoe Machinery Corp. v. Day Wood Heel Co., 46 F. (2d) 897 (C. C. A. 6, 1931), and also Union Trust Co. v. White Motor Co., 23 F. (3d) 816 (1937), although there was a signed and deted drawing, Judge Westerhaver pointed out that the other picusualization of the proof were sighed as to cant doubts upon the integrity of the drawings but also of the vitaesses; and in Universal Ries Co., v. Firestone Sheel Products Co., 289 Fed. 884 (1923) urged by plaintiff, only oral evidence was submitted.

On the other hand, there is Open Hearth Steel Fursace Co. v. Youngstown Sheet & Tube Co., 2 F. (2d) 94 (1924), where there was testimony of several prior uses

at different places, and Judge Westenhaver said, p. 97, "even if they are to be regarded as abandoned experiments rather than discontinued inventions, they should not be denied a place in the open hearth furnace art; each will be considered as a part thereof." Such situation is quite comparable to the facts of the present case, where the T-slot expedient has been shown to have been used by many persons other than Gulick, and including Monek-meier, Schoengarth, Long and others, working independently and all resorting to the same expedient upon encountering expansion difficulties in their pistons.

SCHOKEGERTH PINTONS.

Defendants offered in evidence the Schoengarth pistons, urging that this showed (1) the public use of that piston for two years prior to Gulick; (2) another use of the old T-slot expedient more than two years prior to the Gulick amendment of September, 1922; (3) how another mechanic put an adjusting device on a piston with a T-slot or left it off, depending upon the character of the cylinder; and (4) another instance of intervening rights

years prior to the said a

Schoengarth, patentee of No. 1,174,092, testified to the use of the expedient of T-wise splitting the skirt of a piston. He installed four pistons in a Ford truck in the spring of 1315 before writing to his patent attorneys on May 4, 1315. At that time he also made the drawing (Ex. 5-K-2) and the pistons were made and sold prior thereto. Before November, 1915, to replaced one of the original pistons sold with an oversite piston provided with a T-slot and without the adjusting device. Thereafter, he made pistons with a sunewhat different adjusting mechanism, and outs of pistons like Ex. 5-K-10 before March 26, 1917, which date is fixed by correspondence with his patent attorneys, the pistons operated until 1999. 1995.

Pollowing Schoungarth's appearance as a witness an adjournment was had, and defendants' counsel stated that he would call Charles Garland, a spechanic who had worked with Schoungarth on the installation of his pistons in 1915, who was then too sick to appear to testify. Death overtook Garland before he testified, and Schoen-gurth testified that Garland had been interviewed by plaintiff's counsel during the recess. Any criticism of Schocagarth's testimony is hardly to be seriously considered since plaintiff's counsel have offered nothing to contradict his story, apparently given in good faith.

Schoengarth did not attempt to cover the T-slot expedient in his patent, so that feature became abandoned by him to the public. His testimony is clear that the T slot expedient was in the set of pistons sold in the spring of 1915 and should constitute a bar to the claims of the Gulick patent directed to this feature. There is the further Schoengarth piston (Ex. 5-K-10) embodying arrangement of the Telot with the head diameter ex-

arrangement of the Telot with the head diameter extending down and overlapping the horizontal slot, which
construction seems to constitute a reduction to practice
and actual use of pistons. Further, as defendants arge,
if the Schoengarth pistons are not sufficient to constitute
a public use, his testimony and his patent application constitute intervening rights which should be an equitable
estoppel as against this plaintiff.

Gulick and his counsel overlooked Schoengarth, or
must have thought he would not show up for they diligently proceeded to antidate the Schoengarth patent by
the affidavit under Rule 75 (Ex. 4-L. p. 1859), which, if
not untruthful, at least misted the Patent Office. The presence of the adjusting mechanism in the Schoengarth pistons seems to be immaterial so, far as this case is concerned for the Telot, either with or without the adjusting mechanism, operates the same, that is, permits expancorned for the T-slot, either with or without the adjusting mechanism, operates the same, that is, permits expenmon and contraction of the skirt. I no one before had
suggested a flexible piston it might be a different situation, but this had been suggested by Franquist in 1914,
Rainforth in 1912 and Berex in 1911 and 1912, followed
by Long, Spillman, Hives and even by Jardine and
Maynard; and plaintiff accepted the ruling of the Patent Office that Libbs did the same thing in 1902.

Plaintiff arged that there was only one witness produced to prove the use of the Schoolgarth pistons. However, the fact that only one witness was produced does not alone justify a court in refusing to consider the subject of the testimony. In Corose Good Tire v. Doves Corp., 276 U.S. 358 (1998), the Supreme Court accepted the uncorroborated testimony of a Dr. Kratz on the subject of a sale of 300 inner table, which was supported only by records of the order, and Mr. Chief Justice Tail and n. 362. said, p. 382:

"It was not unastural that with a small amount of D. P. G. he should try it in a special order of this kind from which he might confirm the conclusion he had already reached. The effort to dispreve it was vague and inconclusive, which, it is only fair to say, was to be expected five years after the event." The same can be said of Schoengarth for he had demonstrated the utility of the T-slot in the pistons of his patent, and it was, therefore, "not unnatural" that he should alit and install an oversine piston which did not require the adjusting means to keep it expanded. The testimony of one witness was also accepted as proof of the completion of an invention in Armstrong v. De Forest Radio Telephone & Telegraph Co., 280 Fed. 584 (1922), where on p. 590 Judge Manton of the 2nd Circuit asys:

"There is no reason to doubt the testimony of the patentee as to the date of his inventive thought. While it is true that uncorroborated testimony of an inventor is to be accepted with caution (Clerk Thread Co. v. Williamantic Lines Co., 140 U. S. 481, 11 Sup. Ct. 846, 35 L. Ed. 521), yet there is no rule of law that requires the rejection of the uncorroborated testimony of an inventor as to the date of his conception. The court must be satisfied as to the fact of demonstration and that the conception was complete."

Lone Persons.

Defendants offered in evidence the Long pintons, and urge that these showed intervening rights, and examples of the expedients of the Talot, but as against Jardine and Maynard, Long is offered for all purposes.

The Long pintons, patent Nos. 1,295,441, 1,489,499 and 1,872,772, are pleaded as a prior use (Duf. Ex. 4-H), and examplifications of the Long 6-slotted pintons are Defendants Era E. F. G and R. Long submitted pintons to Praiskin Magnifecturing Company as early as March, 1916, as was also shown in interference proceedings, and on appeal in Hartog v. Long. 47 F. (2d) 369 (1951), the court says, at p. 370:

Louis M. Stillman, a witness whose testimony displays an intelligent grasp of the hituation, and who was, at that time, third angineer of the Franklin Manufacturing Usermany, testifies that in the early part of the year 1916 he talked with Long, and that Long displayed to him and others a piston of the type in question and which, according to his testimony, may be read plainly upon the second count of the interference."

As against the Gulick patent it is urged that the Long pintons constitute adverse rights to the expansion

of the Guliek application years after the Long pistons had gone into commercial use. These Long pistons illustrate the embodiment of the common Talot expedient.

As against Jardine and Maynard it is urged that the Long pistons operate with full force and effect from the standpoint both of anticipation and lack of invention. It cannot be said that the Long pistons were impractical, for they were used in the air-cooled Franklin engine where pistons operate under the most adverse conditions.

The Long pintons, with the increase of engine speeds, went out of use in Franklin in 1926, plaintiff claims because the Long pintons scored at the junction of the webs with the skirt. This would have happened to Onliek, as well as to Jardine, mather of which patents was ever put into use, and the same thing happened to Maynard when it was attempted to use that patent structure. That the Long pintons went out of use seems to be immaterial. Plaintiff urges that defendants claim of intervening

Plaintiff urges that defendants claim of intervening rights was disposed of by the case of Ross v. McMilles, 64 F. (2d) 568 (1933), "because Gulish disclosed and claimed broadly his piston from the beginning." Of source defendants contention is that the Gulick claim was broadened in 1922 to cover something that he never had when filed, and if such view is adopted there is no pertinency in Ross v. McMilles, supra, as plaintiff contends.

INFRINGEMENT.

For the reasons previously given, the patents in suit are held invalid, which particularly applies to the claims alleged to be infringed by the Starling and Ray Day pistons. The order of reference is general, and to comply therewith there must be consideration of the question of infringement. If any or all of the patents, or all or any of the claims alleged to be infringed about be held to be valid, they must be strictly construed as not to be

infringed.

If the Guliek and Jardine patents differentiate from the prior art at all, it is by the employment of flexible webs extending from the wrist pin bosses to the skirt, which the Bay Day pinton does not have, and the proof is here that the Berling piston (Ez. 1) does not have such flexible webs as contemplated by the patents. The other Sterling pistons have no webs. The Galikk patent is thus restricted to a structure in which flexible webs extend from the wrist pin bosses to the skirt and are surrounded by the skirt, while the Jardine patent is re-

stricted to a slipper piston having flexible webs, and neither can comprehend a trunk piston with a dashed-in relief.

The Mooers patent is restricted to narrow connectors extending from the head flange to the bottom of the skirt, closely hugging the inside of the skirt so as to leave substantially 360 degrees separation. Sterling follows the Franquist patent and has from one-fourth to one-half isolation, that is through 90 to 180 degrees, with a connection between the head and the skirt in the region of the wrist pin bosses, made by heavy connectors as in Ex. 1, and extending for a quadrant. In Ray Day the connectors are from the head to the wrist pin bosses, requiring a sand core and are not from the head flange to the skirt permitting permanent molding.

The Schmiedeknecht patent is restricted to a construction in which each boss is supported at its end, with one end of the boss supported from the head, and the other end supported from the web. In the Sterling piston (Ex. 1) each boss is supported at its center, the opposite of what is described and claimed in the Schmiede-

knecht patent.

The Maynard patent is not infringed unless the webs are flexible and so described in that patent, but that must be due to a construction contemplated by that patent, as plaintiff's expert said this was necessary as far as Gulick and Jardine patents are concerned. In the Sterling piston (Ex. 1) compensation is not secured at the top by web flexibility, but by the Keystone relief; and thus on plaintiff's claim Ex. 1 departs from the Maynard patent.

None of defendants pistons have such identity or

None of defendants pistons have such identity or correspondence of structure, function and mode of operation as contemplated by the patents in suit, and particularly is this true as to those patents which are re-

stricted by the prior art.

Heretofore has been considered the situation where a defendant has followed the prior art, citing decisions of this Circuit, following the leading case of McCormick v. Teleott, 61 U.S. 402, where Judge Grier said, p. 405:

"But if the invention claimed be itself but an improvement on a known machine by a mere change of form or combination of parts, the patentee cannot treat another as an infringer who has improved the original machine by use of a different form or combination performing the same functions. The inventor of the first improvement cannot invoke the doc-

trine of equivalents to suppress all other improvements which are not mere colorable invasions of the first."

To the same effect is Electric Signal Co. v. Hall Signal Co., 144 U. S., 87 (1885), where Mr. Justice Matthews

says, at p. 96:

"But this result or idea is not monopolized by the patent. The thing patented is the particular means devised by the inventor by which that result is attained, leaving it open to any other inventor to accomplish the same result by other means. To constitute identity of invention and therefore infringement, not only must the result attained be the same, but in case the means used for its attainment is a combination of known elements, the elements in both cases must be the same, and combined in the same way, so that each element shall perform the same function, provided, however, that the differences alleged are not merely colorable, according to the rule forbidding the use of known equivalents."

And again in Westinghouse v. Boyden Brake Co., 170 U. S. 537 (1898), Mr. Justice Brown says, at p. 569:

something more than reach the same result. He must have reached it by substantially the same or similar means, or the rule that the function of a machine cannot be patented is of no practical value."

And after pointing out that "a charge of infringement is sometimes made out though the letter of the claims

be avoided." he also says, p. 568:

The converse is equally true. The patentee may bring the defendant within the letter of his claims, but if the latter has so far changed the principle of the device that the claims of the patent, literally construed, have ceased to represent his actual invention, he is as little subject to be adjudged an infringer as one whe has violated the letter of a statute has to be convicted when he has done nothing in conflict with its spirit and intent."

The rule of Railway v. Sayles Co., 97 U. S. 554 (1878), has been continuously followed in this Circuit, as follows, p. 556-7:

"But if the advance toward the thing designed is gradual, and proceeds step by step, so that no one

can claim the complete whole, then each is entitled only to the specific form of device which he produces, and every other inventor is entitled to his own specific form, so long as it differs from those of his competitors, and does not include theirs."

The court, in I. T. S. Rubber Co. v. Essex Co., 272 U. S. 427 (1926), decided that as to a claim which does not include on its face a limitation obviously intended,

says, p. 442:

be construed and have the same effect as if it had been included. This is not in any real sense, a remaking of the claim, but is merely giving to it the meaning which was intended by the applicant and understood by the examiner."

And, at p. 444:

"So where an applicant whose claim is rejected on reference to a prior patent, without objection or appeal, voluntarily restricts himself by an amendment of his claim to a specific structure, having thus narrowed his claim in order to obtain a patent, he may not by construction or by resort to the doctrine of equivalents, give to the claim the larger scope which it might have had without the amendments which amount to a disclaimer." Weber Elec. Co. v. Freemen Elec. Co., 256 U.S. 668, 677."

In this Circuit the courts have had these questions before them on many occasions. In Lektophone Corp. v. Crosley Radio Corp., 46 F. (2d) 126 (D. C. Ohio, 1928), Judge Hickenlooper, while District Judge, gaid, p. 130:

"The defendant has done up more than to draw from the prior art, albeit including Hopkins, the various elements, themselves, all old, which accomplish to a material extent the desired results which it is claimed Hopkins accomplished, but by a combination of elements differing radically from the Hopkins combination in at least this one respect."

"Hopkins nowhere taught the necessity of, or claimed as an element of his invention, means for restricting the edge of the cone against deformation. This was an incidental or accidental function of his annular rim, but there are many ways of accomplishing the same result. Hopkins chose one; the defendant another. So long as the defendant's

means of accomplishing the desired result is not merely the substitution of the mechanical equivalent for that of Hopkins, there can be no infringement."

In view of the fact that defendants' pistons approach the prior art as much if not closer than they do the pistons in suit, this case is quite in point, netwithstanding plaintiff's urge that the differences are only equivalent combinations. Such differences are shown by the means to secure compensation for expansion at the top of the skirt of the Sterling piston, and also in the Ray Pay piston are different than the patents claim. Even in the Sterling piston (Ex. 1) which is said to have flexible webs but has none, the compensation at the top is secured by the Keystone relief which is unknown to Gulick, Jardine and even Maynard if the Maynard patent is a modified Jardine structure.

In Fowler v. Detroit Bedding Co., 47 F. (2d) 752 (1931), in a Per Curion decision, the court said, at p.

752:

decide), the invention consists in so tapering and overlapping the ends of the bat that when it is folded about the core a bandage of uniform thickness results, or in the simplicity with which the bandage is manufactured, by merely tapering the ends of the bat before folding it."

Although the claim in that case was restricted to "tapered edges imped on one side of the paper core," the contention was the defendant infringed because the claims could be read upon defendant's structure. The court, however, says, p. 752-3:

"Any slight tapering of the edges was not due to design, but was incidental to the manner in which the sheet or but of the material came from the machine or to the effect of forcing it into the pleat of the cushion."

In Directoplate Corp. v. Donaldson Litheyrophing Co., 51 F. (2d) 199 (1931), Judge Hickenlooper refers, as in other cases (p. 202) "to a specific construction of clearly defined elements all pertaining to the inventive step as he then understood it."

Further than this, the defendant's device utilines the forces of nature and operates in a manner substantially different from the device of the patent. The Bearing section of the claim, as a separate unit unattached to negative or positioning frame, for so the claim must be construed in view of the specification, is wholly absent. So also are the practically unlimited play of the inner sealing strip upon the negative, the flange of the positioning section, and the function of the bearing section in horisontally bridging the gap between the negative and the positioning section. Elements of the claim are omitted, but more than this, the manner of operation of the two devices, we are convinced, is substantially different. If this be so the defendant's device does not infringe."

Again in Goodyear Tire & Rubber Co. v. India Rubber Tire Co., 51 F. (2d) 204 (1931), in considering the status of the patent in view of the prior art, Judge Hickenlooper said, p. 206:

"Here, the crowded condition of the patent art, the closely analogous uses by others (even if they be not regarded as anticipations), the nature of the disclosure, the very essence of the alleged inventive step, and the Patent Office proceedings, involving a possible este, pel, all limit the appellee to a breaker-strip of layers of parallel cords interposed between the tread and the cushion, as provided in the claim and under principles more fully discussed in our opinion in Directoplate Corp. v. Donaldson Lithographing Co., 51 F. (2d) 199, this day decided."

To the same effect in Willett Mfg: Co. v. Roof Spring Scroper Co., 55 F. (2d) 858 (C. C. A. 6, 1932); Ottinger v. Perro Stamping & Mfg: Co., 59 F. (2d) 640 (1932), decisions also by Judge Hickenlooper; and there is the very recent case of Chicago Forging & Mfg. Co. v. Bade; Cummings Mfg. Co., 63 F. (2d) 928 (1933), where Judge Simons says; p. 980:

"The defendant's device (see illustration), lacks the opposing inclined surface which we regard as necessary elements of the claim if it is to be considered as supported by the disclosure."

"Obviously, and this was recognized by plaintiff's expert, the patentee was not entitled to claim all structures which exercised the desired function, but only those which he himself invented, and a device which produces the same result through translation of force operates in a substantially different manner than one in which force is directly applied." Plaintiff urges that a different rule was followed by the Court of Appeals in Byers Machine Co. v. Keystone Driller, 44 Fed. 283 (C. A. 6, 1930), where the patents on a trench digging machine were held valid and infringed, but that case is clearly to be distinguished, for there the court said, p. 285, "that Clutter was a pioneer in this particular form or type of trench digging machine, and that claim 4 is entitled to a broad construction," which is quite different from the case presented at bar.

In Remington Rand, Inc., v. General Fireproofing, Equity No. 3441, before this court; it was said, p. 16:

art, so that at the time the application was made for their patent, only improvements could be patented by them."

And further, at p. 22:

"The role is, that where the patent does not embody a primary invention but only an improvement to the prior art, and the defendant's machines can be differentiated, the charge of infringement is not sustained."

And again, in Cleveland Tractor Co. v. International Harvester, Equity No. 3860, it was held that claims must be construed not only in the light of the specification, but in light of the proceedings of the Patent Office, and it was said, at p.23:

"The rule of patent law is well established that the claims must be construed in the light of the specifications and drawings. Defendants cite Computing Scale Co. of America v. Automatic Scale Co., 204 D. S. 609, in which there was read into a broad claim for 'mechanism' for doing a certain thing, the particular construction of such mechanism defined in the specification, in order to distinguish the invention from the prior art."

The listing of the Galisk patent as a pieceer patent, Jardine and Maynard as improvements which accomplish the useful purpose in a successful commercial form, and the Moore and Schmiedknecht patents as patents which contribute to the ntility and commercialization of that prior invention, is not justified on the record in this case. When it comes to infringement, the use of the Keystone relief in the Sterling piston (Ex. 1) compensates for expansion at the top where it is required, as distinguished

from making the webs fexible, and as to prior art, the mechanic had all the expedients at his command which he would naturally employ, and of this the Supreme Court says, in Webster Loom Co. v. Higgins, 105 U. S. 580 (1881), Mr. Justice Bradley saying, at p. 586:

"He may begin anthe point where his invention begins, and describe what he has made that is new, and what it replaces of the old. That which is common and well known is as if it were written out in the patent and delineated in the drawings."

RESORT TO "SYMPTOMS OF INVENTION" SO-CALLED, UNNECESSARY FOR SUCH NOT HERE CONTROLLING.

Plaintiff urges on behalf of the validity of these patents several arguments or claims which might be called "symptoms of invention." These are the long-felt want, prior efforts and failures, public adoption, public acquiescence and commercial success. The weight to be given such "symptoms of invention" in passing on patent validity is well settled. They are important and entitled to weight only when question of validity is doubtful.

Defendants answer that aluminum pistons were not needed until the recent developments of high speed automobile engines, and cits that even now one large manufacturer, General Motors Corporation, utill mes iron piston; and there is also what Long showed in the making of aluminum pistons, with its beginnings in 1915-17.

COMMERCIAL ACCRETATION.

The situation here is peculiar, for the structures of none of the pistensein suit have open gone into commercial use. That of Schmiedelmecht, Mooers, Guliar and Jardine not at all, while as to the Maynard design, the proof is that it was not used successfully suitil it had been provided with the Keystone relief. Particularly as to the Maynard piston it was discarded by Chrysler, an unwilling party plaintiff which has the right to its use as a half-owner of the patent.

Sales alone are not a test of patentability. In the early case of McClaim v. Ortmayer, 141 U.S.:419 (1891), Mr. Justice Brown says, p. 428:

"If the generality of sales were made the test of patentability, it would result that a person by securing a patent upon some trifling variation from

previously known methods might, by energy in pashing his goods drive competitors out of the market and secure a practical monopoly, without in fact having made the slightest contribution of value to the useful artz."

The plan of plaintiff and its licensees has been to control the market in the manufacture of aluminum pistons, and former competitors Bohn Aluminum & Brass and Kant-Skore became sub and collateral licensees. The statement is made that a settlement was made with Long, who had been a competitor, and although the terms do not appear in this case, such fact is admitted in plaintiff's and bear a 160. tiff's reply brief p. 160.

The language of Mr. Justice Stone in the recent Radio case of De Forest v. General Blectric, 283 U. S.

664 (1931) is in point, where he says, p. 685:

"Only when invention is in doubt may advance made in the art be thrown in the scale to support it. If we were to assume that invention here was doubtful, we can find little to suggest that the high vacuum tube when produced satisfied a long felt want or that its present stility is indicative of anything more than the natural development of an art which has passed from infancy to its present maturity since Language filed his application. There was little or no practical me for a high vacuum tabe in 1913. The De Forest audion was not in general use and Language did not see one until that year."

That was also a case where the application filed in 1913 issued some 12 years later in 1925, and it was held that no single element was broadly novel in the assemblage of elements making up the device defined in the issue.

The Court of Appeals of this Gircuit had milested the same view in Jackson Shirt of Novelty Go. v. Resentance, 225 Fed. 331 (1915), and in Wiston Motor Garvings Go. v. Linday Anto Party Go., 230 Fed. 321 (1917), where the specific design of the patent atmosphere mover was successful and this not become successful until redesigned with improvements which said of this Judge Denison says, on the question of commercial success, p. 537.

but there is slight rount to infer that its commercial acceptance was the to the merits of

its commercial acceptance was due to the merits of this particular patent rather than of the other pat-ents and improvements which it embodied, and still

less to attribute its commercial success to the comparatively minor structural detail, vis. the peculiar sectional easing, without which it would not have responded at all to the two claims in suit. The commercial success of this Timken axle throws no light on the validity of this claim."

Also, the late Judge Westenhaver commented on the fact that "sales are due to the growth of industry and trade conditions and in no wise to the specific contribution," in Troy Wagon Works v. Ohio Trailer, 264 Fed. 347 (D. C. Ohio, 1920). In other Circuits there is Haggerty v. Rawlings Mfg. Co., 14 F. (2d) 928 (C. C. A. 8, 1926), and in Fleischman Yeast Co. v. Federal Yeast Co., 8 F. (2d) 186 (D. C. 1925), affirmed 13 F. (2d) 570 (C. C. A. 3, 1926), Judge Soper said, p. 199:

"Commercial success of a patented article is not persuasive evidence of invention as to a claim which eggers only a part of the device or process, and, when it is shown that the claim in controversy does not cover the whole of the patented device or process, the weight of such evidence is very much reduced."

Such statement is pertinent here, for the patents formerly relied upon were the Spillman & Mooers and Franquist patents which expire in 1931 and 1932 respectively.

Acquirectures.

The various consent and default decrees on some of the patents in suit cannot help the plaintiff in this proceedings, nor is plaintiff helped by the fact that other suits are pending against Chrysler and Ray Day for the mere filing of a suit is only the assertion of the claim.

Until their expiration, plaintiff could rely upon the Spillman & Mooers and Franquist patents, and that piston manufacturers did not contest is no criterion of validity; for even the value and general use of a device will not contain a putent if the lack of invention is clear. Of a attention not unlike that presented here, with the trustee owning many piston patents, Mr. Justice Holmes of the Supreme Court, in the recent Mineral Separation v. Maggie Copper, 280 U.S. 400 (1930), says at p. 404:

"The petitioner adverts to the success that has attended the later patent and to the fact that the world waited until it appeared. But interlopers naturally would be slow to venture the field occu-

pied by a powerful company armed with patent No. 835,120 and supported by a subtle ingennity that we cannot doubt would have been exercised with even more effect to show that a process like that in No. 962,678 was an infringement than it now is to prove that the later patent was a revelation that transformed the art."

PRIOR ART NOT CITED IN THE ANSWER.

Over plaintiff's objection, there were offered in evidence several patents, publications and prior uses which were not cited in the answer. These included the patents to Howe, Leitzenmayer, Roots British, Serex French, Hartog and Pomeroy, articles by Ricardo in "The Automobile Engineer," by Gunn, Engineer of Packard, in "Automotive Industry," articles in "Automobile" of March 5th and March 12th, 1914, articles in "Horseless Age" of April 8, 1914 and December 24, 1913, the public and prior use by Monchmeier and Schoengarth, and sales by Schoengarth. As to Schoengarth, plaintiff later consented to an amendment to the answer.

Such patents, publications and prior uses constitute evidence of prior invention unless Gulick establishes an earlier date of invention, and the evidence offered seemed to be good references under R. S. 4990. The prior invention and not the patents which have been issued to such inventors constitute the defense as authorized in the second paragraph of the statute, and such defense

is pleaded in the answer.

The rule is that notice need not be given prior to trial, of patents or other defences to be introduced for the purpose of showing the prior art to demonstrate the lack of invention as distinguished from anticipation, Grier v. Wit., 120 U. S. 412 (1887); Graham Paper Co. v. Interactional Paper Co., 46 F. (2d) 881 (C. C. A. 8, 1931). The reason for such rule is pointed out by Judge Stone in Zip Mfg. Co. v. Pusch, 2 F. (2d) 828 (C. C. A. 8, 1924), where he says at p. 830:

"The purpose of the statute is to prevent surprise in the evidence by giving the plaintiff thirty days notice of the particular patents and usage which will be relied upon in the challenge of the patent. Obviously, where the plaintiff must know of such instances; this notice serves no purpose. Such was the case of Brown v. Piper, cited above, where

prior usage was of such nature that the court took judicial notice thereof. It would seem to be an even clearer occasion for applying the same reasoning where the usage relied on is shown, in the language of the very patent in suit, to have been known to the plaintiff at that time. We think, therefore, that the trial court was right in considering, on the point of validity, the clear statement in this patent that grinding mixtures, employing oil as a binder, were known to the art and that the improvement claimed was a change in the 'binder' from oil to starch."

The Pumercy and Hartog patents in question are owned by the trustee plaintiff as shown in its prime foote case, and the Hartog patent was in Interference with Gulick. The Howe patent and the Hives British patent were cited by the Patent Office against the Mayaard patent and the Schwengerth patent were also cited during the prosecution of the Gulick application and antidated Gulick. The Kant-Store piston was known to plaintiff as it was manufactured by its licensee. None of these came as a surprise to plaintiff.

provided in the Bill of Com-The particular plate plaint were the Sterling piston Ex. 8. As the trial progression for the case five Stering Ray Day piston, asserting the five at the five to of Guliek, thre the scope of Maynard and Mooers. Followin 1911 and 1-1911 and plaintiff's d 1914 Gullek

OWN COLUMN police to a lotting the pio-d particularly by the Tstandpoint of a well-known or tons through and through, as slot. Such alotting was shown in the patentagin Ebbs, Van Bever, Schoesgarth, Vigget, Spillman, Long, Rainforth, Hives, Hartog, and now by Monekmeier and Screx, i.e. from Ebbs in 1902 to Hives in 1920. Thus the Talot was known over this puriod, and it seemed proper to re-ceive evidence of additional instances of its potoriety without previous notice or in the answer; and this under the decisions of the court constraing R. S. 4920, as was also done in Gleveland Tractor v. International Hornester, supra.

This practice is authorised by the rule as announced in Elliott & Co. v. Youngstown Cor Mfg. Co., 181 Fed. 345 (C. C. A. 3, 1910), by Judge Archbald, at p. 349:

"The fact that so many persons caught the idea goes rather to prove that it was simple and obvious, and not that it required inventive genius to conceive. It is not like the case where the art is waiting for the device, and inventors striving unsuccessfully to produce it, under which circumstances invention may well be held to appear."

Cited with approval by Judge Killits of this District in Phoesis Kuitting Mill v. Rick, 194 Fed. 721 (1911), Pressey v. Benis Bree. Bag Co., I F. (2d) 116 (C. C. A. Pressey of Bessie Bree, Bog Co., 1 F. (2d) 116 (C. C. A. 8, 1924); and Judge Westenhaver took the same view in Open Hearth Purnace v. Youngstown Sheet & Tube Co., 2 F. (2d) 24 (1924), where there were a number of prior was of the patent at different phase.

The originate of both the Monakmeier are and the Serax Pressh patent can be here used to restrict the claims of all the patents in suit, particularly in view of plaintiff's insistence that the ordinary trunk piston provided with a relief and a Tulot, both known in the art, some within the scope of the patents in suit.

ALEEGED COPTING BY DEPENDANTS.

Plaintiff places much stress on the fact that the Sterling picton (Ex. 1) looks like that being sold by its licensess, although this fast hardly be mid of the other. Sterling pictons and certainly not of the Ray Day pastons. As to this Sterling picton, the recent statement in Buttendorf Co. v. Ohio Steel Foundry, 56 F. (2d) 777 (C. C. A. 5, 2022), by Judge Hickmhopper, seems to be in point, at p. 779:

"Clearly, if the claims as stated fail to disclose a patentable invention no license is required, the device may be made and used by any one."

The more copying of a device put on the market by plaintiff is not actionable unless a defendant palms of

its goods as those of plaintiff, and there is no widence of that; also there is no allegation of unfair competition

and plaintiff is not a manufacturer.

The defendants have not copied the structure of any of the patents in suit, not even that of Maynard, for a characteristic feature of Ex. 1 is the Keystone relief furnishing compensation at the top of the skirt, and compensation at the bottom being secured in the way long known to the art by splitting the piston skirt from the bottom up. Should plaintiff answer that the defendants are estopped to deny the utility of the Maynard piston without the Keystone relief and in spite of modification of Maynard as used, on this question of utility there is the statement in Sandy MacGregor Co. v. Vaca Grip Co., 2 F. (2d) 655 (1924), where Judge Denison says, at D. 656:

"Sufficient practical utility to make a device 'useful,' in the sense of the patent statute, is, we suppose, what is meant by the cases which say that an infringing defendant is estopped to deny atility.

The phrase patentable utility is sometimes perhaps rather inaccurately used to denote the function of being useful plus the skill of the inventor as distinguished from that of the mechanic. Of course, the infringer is not estopped to deny patentable utility in this sense, because if he were he could never dispute patentability."

And this view of the Court of Appeals was followed in Seymour v. Ford Motor, 44 F. (2d) 306 (C. C. A. 6, 1930).

Consideration has been given to all the issues, and there has been omitted from this report any discussion as to the efforts of plaintiff or The Aluminum Company an to the efforts of plaintiff or The Aluminum Company of America to establish and control a monopoly in the manufacture of aluminum pistons. Defendants cornectly arge this so be a victous monopoly, but that question is not here for discussion, and even if it were here, a disposition of such question has been made unnecessary by the findings of invalidity and non-infringement.

The Master reports that on the 30th day of December, 1933, he handed draft copies of this report to counsel and saided that errors and correction to be made be pointed out by counsel by January 15, 1994, that the Master might consider and make such corrections insofar as the Master believes proper and in heeping with the views as expressed in this report. Such suggestions have

views as expressed in this report. Such suggestions have

been received and corrections made in the report. Two copies of this report have been furnished to counsel for each party.

Herewith I hand up for your Honors the following:

- (1) Original files and papers from the Clerk of the Court in the three cases.
- (2) Stipulations.
- (3) Transcript of testimony, together with 134.
 Plaintiff's Exhibits and 91 Defendants' Exhibits.
- (4) Briefs of counsel.
 - (5) Suggested findings of fact and conclusions of law submitted by counsel.
 - (6) Report of Special Master.

Respectfully submitted,

WM. B. Woons, Special Master.

January 27, 1934.

Copies to:

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PLAINTIPPE EXCEPTIONS TO THE REPORT OF THE SPECIAL MASTER.

(Filed February 26, 1934.)

[Case No. 4045.]

Now come the plaintiffs and file this, their objections and exceptions to the findings, conclusions and report of the Hon. William B. Woods, Special Master, filed January 27, 1934, as follows:

EXCEPTION NO. 1.

Plaintiffs object and except to the Master's Finding of Fact No. 21 (M. R. p. 1008) and to each of the following statements and conclusions thereof:

(a) "That the pistons of the Gulick patent embodies the fundamental structure of the Franquist patent No. 14153,902"

as contrary to the evidence; see the testimony of Defendants' witnesses Stellman R. pp. 536, 553, 554 and 567, Dorris R. pp. 1078 and 1079, Jeffries, made defendants' witness on cross examination exceeding direct, over plaintiffs' objection, R. pp. 175 to 178, and plaintiffs' witness Jeffries R. pp. 201 to 203, 248, 942, 943 to 945 and 952; and see defendants' Exhibit 3-Q, piston made in accordance with the Franquist patent R. p. 178, and defendants' Exhibit 4-L, Gulisk file wrapper, p. 1938 (citing Franquist patent); and as contrary to the evidence cited in support of Exception 3 hereof; and except and object to the statement:

(b) "and that the piston of the Franquist patent is operative to substantially compensate for expansion"

as contrary to the evidence; see evidence cited under "in", supra; and except and object to the statement and conclusion:

The following authorities have been relied upon for the form and manner of the exceptions taken herein:

Harding v. Heady et al., 11 Wheaton, 103, 5 L. Ed. 429; Shefield v. Gerdon, 151 U. S. 285, 38 L. Ed. 164; Sandford v. Bubry, 151 Fed. 977, 982 (C. C. A. 8th); Columbus etc. By. Appeals, 109 Fed. 180, 219 (C. C. A. 8th);

Savage v. Monarch, 64 Fed. 2d. 650, 651 (C. C. A. 10th); Thomson v. Stornberg, 55 Fed. 2d. 715, 716 (D. C. Ill.); Fordyce v. Omahs, 145 Fed. 544, 557 (C. C. Mo.).

(c) "that the piston of the Gulick patent employs essentially the wils of the Spillman & Mooers patent No. 1,002,670 and of the Chenard & Walcher Patent No. 400,505"

as contrary to the evidence; see testimony of defendants' witness Stellman R. pp. 495 and 562, Jeffries, made defendants' witness on cross examination ampeding the direct over plaintiffs' objections R. pp. 161 to 167, plaintiffs' witness Jeffries R. pp. 195 to 197, 945 to 949, and see plaintiffs' Exhibits 84, 67c p. 1539 and defendants' Exhibit 4L. Gulick file wrapper, pp. 1843, 1849, 1936 and 1938, (citing Spillman and Moores and Chemard and Walcker); and as contrary to the evidence cited in support of item (a), sepre, and plaintiffs' Exception No. 5 post; and except and object to the statement and conclusion:

(d) "that the web construction of the Gulick patent differentiates from these of Spillman & Mooors and Chemard's Walsher simply in matter of design involving mechanical skill"

as contrary to the evidence; see testimony of defendants' witness Stellman, Deposition R. p. 458, R. pp. 554, 555, 556 and 566, and contrary to the evidence cited in support of items (a) and (c) supre, and plaintiffs' Exception No. 3 post; and except and object to the statement and conclusion:

(e) "that splitting of the skirts of the Franquist, Spillman & Mooers and Chenard & Waleker patents by through slotting was within the purview of one skilled in the art."

as contrary to the evidence; see testimony of defendants' witnesses Stellman R. pp. 460 and 461, 538 to 541, 544, 545 to 547, 548, 564, 565, 562, 565, 567, 570 to 573, Dorris R. p. 1077, and also centrary to the evidence cited under items (a), (b), (c), and (d) supra and in Exception No. 3, post.

EXCEPTION NO. 2.

Plaintiffs further object and except to the failure of the Master to adopt items 1 and 2 of page 22 of plaintiffs' proposed Findings of Fact, summarised briefly as follows:

That the piston described and claimed in Gulick patent, No. 1,815,733, in suit was based upon a

(35)

new and original combination of elements that, coacting together, gave rise to a new mode of operation of the resulting piston structure, and the new combination of elements described in the Gulick patent and claimed in the claims in suit of the patent provided the first piston structure embodying these elements in combination and having the same mode of operation and accomplishing the results of the Gulick patented piston, and no prior art piston exhibited to the Court has the structure, mode of operation or accomplishes the results of the piston described and claimed in the Gulick patent in suit.

as shown by the evidence; see testimony of defendants' witness Stellman, R. pp. 554 and 566, and of plaintiffs' witness Jeffries R. pp. 188, 189, 195 to 202, 203, 204, 259 and 260, and as shown by the evidence cited in support of Exception No. 1, supra.

EXCEPTION NO. 3.

Plaintiffs further object and except to the failure of the Master to adopt items 1, 2, 3 and 4, pages 10 and 11, of plaintiffs' proposed Findings of Fact, briefly summarised as follows:

(a) That long prior to November 1920 the beneficial properties of aluminum and aluminum alloys as a material for pistons and piston structures was well understood in the art:

as shown by the evidence; see testimony of defendants' witness Stellman, Deposition pp. 458, 459, 460, 463, Dorris R. p. 1078, and plaintiffs' witness Dr. Jeffries R. pp. 90, 91, 98 to 109; and

(b) that there existed a long felt want for such inventions which was long unsupplied;

see testimony of defendants' witnesses Stellman, Deposition R. pp. 458, 460, 480, 538 to 541, 545 to 548, Venner, R. p. 347, and plaintiffs' witness Jeffries R. pp. 67, 92, 145, 185 to 187; and

(e) that there were many prior efforts and failures to accomplish what the patentees accomplished by men of outstanding ability and experience and skill in the art; see testimony of defendants, witnesses Stellman, Deposition R. pp. 460, 461, 463, 464, 466, 467 and R. pp. 545 to 548 and 587 to 590, Derris R. pp. 1074, 1075, 1078, 1079 and 1090, plaintiffs, witnesses Jeffries, R. pp. 185, 205 to 206 and 936, Murphy R. pp. 657 and 662, and Burns R. p. 675; and

(d) that the problem of providing a satisfactory piston in either iron or aluminum was a very com-

plex ploblem;

see testimony of defendants' witnesses Stellman, Deposition R. pp. 459, 460, 463, 469 and R. pp. 588 to 590, Dorris R. pp. 1066 to 1076, 1077, 1078 and 1081, and plaintiffs' witness Jeffries R. p. 64; and

(e) that when the inventions of the patents in suit were made known to the public they were generally and extensively adopted by the public, who, generally speaking, have acquiesced in the patents in suit;

see testimony of defendants' witness Stellman, Deposition B. pp. 461 and 462, 470 and 471, Dorris R. pp. 1073 and 1074, plaintiffs' witness Jeffries R. pp. 78, 126, 132, 135, 136, 955, 1050 and 1051, and see the license agreements plaintiffs' Exhibits 38, 39 and 40, and the piston royalty reports plaintiffs' Exhibit 13; and

(f) that automobile engines were redesigned to take

advantage of aluminum pistons;

see testimony of defendents' witness Stellman, Deposition R. p. 466; and

(g) that there has been persistent infringement in the face of litigation and Sterling Products Corporation duplicated pistons made by plaintiffs' licensees and made a substantial duplicate of pistons shown in the Maynard patent, after having made efforts to produce a satisfactory piston along other lines,

see plaintiffs' Exhibits 10A, 11, 12 and 19, and testimony of defendants' witnesses Stellman, Deposition R. pp. 461, 462, 470 and 471 and Dorris R. pp. 1073 to 1074 and 2168; and

(h) that the form of piston shown in the Maynard patent with slight and immaterial changes has been the standard form of piston ever since 1920. See testimony of defendants' witness Stellman; Deposition R. pp. 461, 462 and 470, and plaintiffs' witness Jeff-ries R. pp. 80 to 86, 126, 132, 135, 136, 955, 1050 and 1051.

EXCEPTION NO. 4

Plaintiffs object and except to the following statements and conclusions in the Master's Finding of Fact No. 12 (M. R. p. 1088)

> "That by admissions of plaintiffs' witness Gulick, Guliek abandoned and had in public use in this country during the year 1911, a piston exem-plified by Exhibit 48, and during the year 1914, a piston exemplified by Exhibit 51;"

as contrary to the evidence; see testimony of plaintiffs' witness Gulick, R. pp. 731, 740, 741, 745 to 748, 754, , 756, 757, 758, 759, 761 and 805, and see defendants' Exhibit 4 L pp. 1842, 1859 to 1863, and 1952 to 1963 inclusive, and interference decisions, plaintiffs' Exhibits 67C p. 1539, 60A p. 1550, 70A pp. 1566 and 1569, and 70B B. 1571

EXCEPTION NO. 5.

Plaintiffs object and except to each statement and elusion of the Master's Finding of Fact No. 14 (M. R.

> "That the Gulick specification while pending in . the Patent Office was broadened beyond the original disclosure while pistons were produced, used and cold by the following parties:

> > Miner C. Long

Gustave C. Monekmeier

Walter L. Schoongarth Albert L. Spillman

Kant Shore Mfg. Co. Stephen B. Hartog Frank Jardine

Aluminum Co. of America Howard E. Maynard Maxwell Motor Co.

Bay Day

William E. Venner"

as contrary to the evidence; see testimony of defendants' witness Stellman R. pp. 567, 577, 578 and 579, Jeffries made defendants' witness on cross examination exceeding the direct, over plaintiffs' objection, R. pp. 150, 155 and 156, and plaintiffs' witness Jeffries R. p. 201; and see defendants' Exhibit & L. Guliek file wrapper; and as contrary to the concurring findings of the Law Examiner (plaintiffs' Exhibits 68A and 69A), the Examiner of Interferences (plaintiffs' Exhibits 67B and 69A'), the Examiners in Chief (plaintiffs' Exhibits 67B), the Commissioner of Patents (defendants' Exhibit 4F), the Board of Appeals (plaintiffs' Exhibits 67C, 69B and 69B"), the Court of Appeals of the District of Columbia 17 Fed. (2d) 686 (plaintiffs' Exhibit 68C), and the Court of Customs and Patent Appeals, 47 Fed. (2d) 365 (plaintiffs' Exhibit 69C).

EXCEPTION NO. 6.

Plaintiffs further object and except to the Master's Finding of Fact No. 14 (M.R. p. 1698), quoted in Exception No. 5, supes, and particularly to that portion thereof which states that certain pistons were produced, used and sold by various parties therein enumerated while the Gulick application was pending in the Patent Office (erroneously said by the Master to have been brundened beyond the original disclosure) as being irrely/ant and immaterial.

EXCEPTION NO. 7.

Plaintiffs further object and except to the failure of the Master to adopt Item 10, pp. 12 and 13 of Plaintiffs' proposed Findings of Fact, briefly summarised as follows:

That claim 1 of the Guliek patent in suit was in Guliek's application when it was originally filed, as original claim 3 (defendants Exhibit 4-L, p. 1839) and remained in the Guliek spidication unchanged throughout the prosecution of the spidication in the Patent Office.

EXCEPTION NO. 8.

Plaintiffs further object and except to the failure of the Master to adopt Item 23, p. 21 of the plaintiffs' proposed Findings of Fast, as follows:

Gustave Monckmeier, Walter L. Schoengarth, Albert L. Spillman, Stephen D. Hartog, Frank

Jardine, Howard E. Maynard and Ray Day individually produced, used and sold no pistons while the Gulick application was pending in the Patent Office. The Kant-Skore Manufacturing Company and Aluminum Company of America produced, used and sold their pistons under license from the Plaintiff The Cleveland Trust Company, which license included the Gulick application, plaintiffs' Exhibits 38 and 39. William E. Venner produced, used and sold not more than three or four sets of pistons, the castings for which were made by Aluminum Company of America (Venner deposition p. 352). The pistons produced, used and sold by Venner or Long after the Gulick application was filed, and the Ray Day piston shown in plaintiffs' Exhibits 85 and 8, and the Jardine (Aluminum Company of America) and Maynard (Maxwell Motor Company) pistons all came within Claim 1, of the Gulick patent (Claim 3 of the Gulick application as filed) which claim has been in the application ever mince it was filed and these pistons likewise came within the subject-matter which was otherwise claimed all during the prosecution of the Guliek application (See claim 1 of Guliek patent and defendants' Exhibits E. F, B and G, and plaintiffs' Exhibits 1 and 8, and Jardine and Maynard patents). Maxwell Motor Company produced, used and sold pistons licensed through Aluminum Company of America, under the patents in suit during the prosecution of the application of the patent in suit. (R. pp. 78, 126, 132, 285, 186, 955, 1050 and 1051.)

EXCEPTION NO. 9.

Plaintiffs except and object to the Master's Finding of Fact No. 15 (M. R. p. 1098) and to each and every statement and conclusion thereof, as follows:

"That after the filing of the Gulick application, his application was materially modified, both as to the specification and claims without warrant therefor in the original disclosure"

as contrary to the evidence; see complete file wrapper and contents of Gulick application, defendants' Exhibit 4-L, and see testimony of plaintiffs' witness Jeffries, B. pp. 173, 174 and 201, and the evidence cited in support of Exception No. 5, supra.

EXCEPTION NO. 10.

Plaintiffs object and except to the failure of the Master to adopt item 19, page 20 of plaintiffs' proposed. Findings of Fact:

> That there was no enlargment of the disclosure of the Gulick specification or claims over the original disclosure

as shown by the evidence cited in support of plaintiffs' Exception: Nos. 5, 7, 9 and 11:

EXCEPTION NO. 11.

Plaintiffs object and except to each statement and conclusion of the Master's Finding of Fact No. 16 (M. R. p. 1099)

"That the Gulick patent does not describe in sufficient detail to enable one skilled in the art to reproduce the same, the length and thickness of the webs required to secure flexibility."

as contrary to the evidence; see testimony of defendants' witness Stellman R. pp. 567, 578 and 579, and plaintiffs' witness Jeffries, R. pp. 173, 174 and 201, and see the concurring findings of the Courts and Patent Office tribunals, plaintiffs' Exhibits 67, 68 and 69 (17 F. (2d) 686, 47 F. (2d) 365 and 47 F. (2d) 367), and as contrary to and irreconcilable with the Master's Findings of Fact Nos. 19 and 24 (M. R. p. 1099).

EXCEPTION NO. 12.

Plaintiffs further object and except to the failure of the Master to adopt item 22 of page 14 of plaintiffs' proposed Findings of Fact in substance briefly as follows:

That the Guliek patent in suit is not indefinite and that the disclosure of the Guliek patent in suit is sufficient to teach those skilled in the art how to practice the inventions described and claimed therein

as shown by the evidence cited in support of plaintiffs' Exception No. 11, supra.

EXCEPTION NO. 13.

Plaintiffs object and except to the Mas' or Finding of Fact No. 17 (M. R. p. 1099) and to each a devery part thereof, comprising each of the following statements and conclusions:

1

(a) "That the Jardine patent embodies the fundamental structure of Franquist patent No. 1,153,-902."

as contrary to the evidence; see the testimony of defendants' witnesses Stellman, R. pp. 554 and 566, Dorris R. p. 1079, and Jeffries, made defendants' witness on cross examination exceeding the direct over plaintiffs' objection, R. pp. 177 and 178, and plaintiffs' witness Jeffries R. pp. 202 to 204 and 207; and see defendants' Exhibit 3-Q, piston made in accordance with the Franquist patent R. p. 178, and the tests thereof exhibited to the Master R. pp. 207 and 208; and object and except to the statement and conclusion:

(b) "that it employs essentially the slipper piston structure of the Bicardo patent No. 1,294,833; and"

as contrary to the evidence; see the testimony of defendants! witness Stellman R. pp. 529, 554 and 566, and Plaintiffs! witness Jeffries R. pp. 74 to 76, 188, 189, 196, 259 and 260, and see defendants! Exhibit 4-L₂ p. 2052 (Jardine file wrapper citing Ricardo patent); and object and except to the statement and conclusion:

(c) "that the splitting of the slippers of the Ricardo patent was within the purview of one skilled in the art;"

as contrary to the evidence; see testimony of defendants' witnesses Stellman R. pp. 538 to 541, 545 to 547, 547, 554 and 566, Dorris R. pp. 1081 and 1082, and plaintiffs' witness Jeffries R. pp. 117, 142, 144, 145, 184 to 188, 206, 206, 219, 220, 226, 228, 256 to 257, 250 and 261, and the evidence cited in support of plaintiffs! Exception No. 3, supra.

EXCEPTION NO. 14.

Plaintiffs compt and object to such and every statement and conclusion of the Master's Finding of Fact No. 18 (M. R. p. 1699)

"That the Jardine putent piston differs from the piston of the Long putent 1,872,772 in matters involving more mechanical skill."

as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. 529, 562, 554 and 566; and contrary to the findings of the Putent Office in allowing

the claims of the Jardine putent after extensive interferences with various Long applications, including his application that matured into Patent 1,872,772 (defend-) ants' Exhibit 4L, pp. 2068 to 2100) and as centrary to the evidence cited in support of plaintiffs Exception No. 3, suppos, and plaintiffs' Exception No. 42, post.

EXCEPTION NO. 15.

Plaintiffs except and object to each and every statement and conclusion of the Master's Finding of Fact No. 19 (M. R. p. 1099)

"That the Jardine piston differs from the piston of the Gulick patent in matters involving mere mechanical skill."

as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. 554 and 566, and plaintiffs' witness Dr. Juliries R. pp. 74 to 76, and the findings of the Patent Office in allowing the claims of the Jardine patent after numerous and extensive interferences with the Guliek application (defendants' Exhibit 4L, pp. 2068 to 2067) and as contrary to the evidence cited in support of plaintiffs Exception No. 3, supra.

EXCEPTION NO. 16

Plaintiffs further object and except to the failure of the Master to adopt items 1 and 2 of page 24 of plaintiffs' proposed Findings of Fact, unmarised briefly as follows:

The piston described and dained in Jardine Patent No. 1,763,523 was based upon a new and original combination of elements that, counting original combination of elements that, coasting together, gave rise to a new mode of operation of the resulting piston structure and the new combination of described in the Jardine patent in suit and alarmed in the slains in suit of the patent provided the first piston structure embodying these classests in equilibration and having the made of operation and accomplished the results of the Jardine patential picton, and no prior art structure exhibited by defendants has the structure, made of operation, or accomplishes the results of the piston described and claimed in the Jardine patent in scribed and claimed in the Jardine patent in

as shown by the evidence; see testimony of defendants' witness Stellman R. p. 554, and the evidence cited in support of Exceptions Nos. 13, 14 and 15, supra.

EXCEPTION NO. 17.

Plaintiffs except and object to each and every statement and conclusion of the Master's Finding of Fact No. 20 (M. R. p. 1099)

"That the Jardine patent does not describe in sufficient detail to enable one skilled in the art to reproduce the same, the length and thickness of the webs required to secure flexibility."

as contrary to the evidence; see the testimony of defendants' witness Stellman, Deposition R. pp. 461, 462 and 470, and R. p. 529, and plaintiffs' witness Jeffries R. pp. 122, 170, and see the Jardine patent in suit (plaintiffs' Exhibit 3); and as contrary to and irreconcilable with the Master's Finding of Fact No. 22 (M. R. p. 1099).

EXCEPTION NO. 18.

Plaintiffs further except to the failure of the Master to adopt item 22, page 14 of plaintiffs' proposed Findings of Fact, in substance briefly as follows:

That the Jardine patent in suit is not indefinite and that the disclosure of the Jardine patent in suit is sufficient to teach those skilled in the art how to practice the invention described and claimed therein.

as shown by the evidence cited in support of plaintiffs' Exception No. 17.

EXCEPTION NO. 19

Plaintiffs except and object to the Master's Finding of Fact No. 21 (M. R. p. 1000) and to each and every part of each of the following statements made therein:

"The May and patent embodies the fundamental structure of the Franquist patent No.11,153,902, and that the splitting of the skirt by through and through slotting was within the purview of one skilled in the art."

as not pleaded against this patent in defendants' answer; and as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. 528, 554 and 566; and

plaintiffs' witness Jeffries R. p. 204, and the evidence cited in support of plaintiffs' Exception No. 3, supra.

EXCEPTION NO. 30.

Plaintiffs except and object to each and every statement of the Master's Finding of Fact No. 22

"That the Maynard patent piston differs from the piston of the Javdine pistont 1,763,523 in matters involving more mechanical skill."

as contrary to the evidence; see testimony of defendants' witness Stellman, R. pp. 554 and 566, and plaintiffs' witness Jeffries, R. pp. 76 and 77; and see defendants' Exhibit 4L (file wrapper of Maynard showing extensive interferences with Jardine) and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, supra.

EXCEPTION NO. 21.

Plaintiffs except and object to each and every statement and conclusion of the Master's Finding of Fact No. 23

"That the Maynard patent piston differs from the piston of the Long patent 1,395,441 in matters involving mere mechanical skill."

as contrary to the evidence; see testimony of defendants' witness Stellman R. pp. 554 and 566, and the evidence cited in support of plaintiffs" Exception No. 3, supra.

EXCEPTION NO. 22.

Plaintiffs except and object to each and every statement of the Master's Finding of Fact No. 24 (M. R. p. 1099)

"That the Maynard patent piston differs from the piston of the Galloc patent in matters involving mere mechanical skill."

as contrary to the evidence; see testimony of defendants witness Stellman, R. pp. 554 and 566, and plaintiffs witness Jeffrice R. pp. 81 and 82, and see differents? Exhibit (L. pp. 1871 to 1893, (Mayned file wrapper showing extensive interferences with Gulish); and bentury to the evidence cited in support of plaintiffs' Exception No. 3, supra.

EXCEPTION NO. 23.

Plaintiffs except and object to each and every statement of the Master's Finding of Fact No. 25 (M. R. p. 1099)

"That the Maynerd patent piston differs from the piston of the Schmiedeknecht patent in matters involving mere methanical skill."

as contrary to the evidence; see testimony of defendants' witness Stellman R. pp. 554 and 566 and see defendants' Exhibit 4L, p. 2219 (Maynard file wrapper showing consideration of Schmiddelmocht patent); and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, supra.

EXCEPTION NO. 34.

Plaintiffs except and object to each and every statement of the Master's Finding of East No. 26 (M. R. p. 1099)

"That the Maynard patent piston differs from the piston of the Bioardo patent 1,294,883 in matters involving mere mechanical skill."

as contrary to the evidence; see testimony of defendants' witness Stellman B. pp. 554, 555, 566 and 574, and plaintiffe' witness Jeffries R. p. 188, and see defendants' Exhibit 4L, p. 2155 (Maynard file wrapper showing consideration of Rigardo patent); and as contrary to the evidence cited in support of plaintiffe' Exception No. 3, supra.

EXCEPTION NO. 25.

Plaintiffs except and object to each and every statement of the Master's Finding of Fact No. 27 (M. R. p. 1009)

"That the Maynard patent piston differs from the piston of the Hives patent No. 140,998 in matters involving more mechanical skill."

as not pleased in defendants amover, and as contrary to the evidence; use the testimony of defendants witness Stellman, R. p. 554, pleastiffs witness Jeffries, R. p. 540, and see defendants Exhibit 414, page 2168, (Maynard file wrapper showing consideration of Hives patent); and as contrary to the evidence cited in support of plaintiffs Exception No. 3, supra.

EXCEPTION NO. 36

Plaintiffs further except and object to the failure of the Master to milest items 1 and 2, page 25 of plaintiffs' proposed Findings of Fact, commercial briefly as follows:

The plates described and claimed in Maynard potent, No. 1,000,000, in suit was based upon a sew and original combination of elements that, conting together, gave rise to a new mode of epoteties of the resulting plates attracture and the new combination of themselve described in the Maynard potent and chimned in the tining in suit of the patent provided the first plates structure embedying these elements in combinations, and having the mode of operation and accomplishing the results of the Maynard patented piston, and no prior art piston exhibited to the Court has the structure, mode of operation described and claimed in the Maynard patent in suit.

as shown by the evidence; see evidence relied upon in support of plaintiffs' Exceptions Nos. 19, 20, 21, 22, 23, 24 and 25.

EXCEPTION NO. 27.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 28 (M. R. p. 1000)

"That the Mooers patent embodies the fundamental structure of the Franquist patent No. 1,153,902 and that the employment of narrow connectors was within the purview of one skilled in the art."

ants' witness Stellman R. pp. 554 and 574, and Jeffries, made defendants' witness by cross examination exceeding direct over plaintiffs' objection, R. pp. 108 and 175 to 178, and plaintiffs' witness Jeffries, R. pp. 202, 204 and 205; and see defendants' Exhibit 4L, p. 1968 (file history of Mogers showing consideration of Franquist patent) and as contrary to the evidence cited in support of Exception No. 3, septs.

EXCEPTION NO. 28.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 29 (M. R. p. 1100)

"That the Mooers patent piston differs from the piston of the Spillman & Mooers patent No. 1,092,870 in suit in matters involving mere mechanical skill."

as contrary to the evidence; see the testimony of defendants' witness Stellman, R. pp. 554, 560 and 561, and Jeffries, made defendants' witness on cross examination exceeding direct over plaintiffs' objection, R. pp. 108 to 109, and plaintiffs' witness Jeffries R. pp. 197, 198 and 204; and see face of Mooers patent citing Spillman & Mooers; and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, supra.

EXCEPTION NO. 29.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 30 (M. R. p. 1100)

"That the Mosers patent piston differs from the piston of the Chenard & Walker patent No. 468,595 in matters involving mere mechanical akill."

as contrary to the evidence; see testimony of defendants' witness Stellman, R. pp. 554, 560, 561 and 562, and plaintiffs' witness Jeffries R. pp. 947 and 948; and see defendants' Exhibit 4L, page 1988, (Moorrs file wrapper showing consideration of Chenard & Waleber patent); and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, supra.

EXCEPTION NO. 30.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 31 (M.R.p. 1100)

"That the Mooers patent piston differs from the piston of the Gulick 1911 and 1914 pistons (Exhibits 48 and 51) in matters involving mere mechanical skill."

as contrary to the evidence; see the testimony of defemiants' witness Stellman, R. p. 554; and as contrary to the evidence cited in support of plaintiffs' Exception No. 3, supra.

EXCEPTION NO. 31.

Plaintiffs further object and except to the failure of the Master to adopt items 1 and 2 of page 27 of plaintiffs' proposed Findings of Fact, summarised briefly as follows:

That the piston described and claimed in Mooers patent No. 1,402,309 was based upon a new and original combination of elements that, coacting together, gave rise to a new mode of operation of the resulting piston structure and the new combination of elements described in the Mooers patent in suit and claimed in the claims in suit of his patent provided the first piston structure embodying these elements in combination having the mode of operation and accomplishing the results of the Mooers patented piston, and no prior art structure exhibited by defendants had the structure, mode of operation or accomplished the results of the piston described and claimed in the Mooers patent in suit.

as shown by the evidence cited in support of plaintiffs' Exceptions Nos. 27, 28, 29 and 30, supra.

EXCEPTION NO. 32.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 32 (M. R. p. 1100)

"That after the filing of the Mooers application, his application was materially modified both as to specification and claims without warrant therefore in the original disclosure."

as contrary to the evidence; see testimony of defendants' witness Stellman R. p. 517, and plaintiffs' witness Jeffries R. pp. 78 to 79.

EXCEPTION NO. 33.

Plaintiffs further object and except to the failure of the Master to find:

That there was no enlargement of the disclosure of the Mooers specification or claims over the original disclosure.

as shown by defendants' Exhibit 4L₄ (file wrapper of the Moors patent), offered R. p. 591, and the affidavits appearing therein on pages 16, 37 and 38.

EXCEPTION NO. 34.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 33 (M. R. p. 1100) comprising the statement and conclusion

(a) "That the Berniedsknecht patent involves the fundamental structure of the Franquist patent No. 1,163,503 or of any trunk piston;"

as not pleaded against this patent in defendants' answer; as contrary to the evidence; see the testimony of defendants' witness Stellman, R. pp. 554, 552, 553 and 522; and plaintiffs' witness Jeffries, R. pp. 114 and 205; and as irreconcilable and inconsistent with the Master's holding (M. R. p. 1119); and excepts to the statement and conclusion:

(b) "that it employs essentially the construction and arrangement of webs and mounting of wrist pin boses of the Pugh British patent 17,256 of 1907 and the arrangement of the webs of the Ferry British patent 12,772 of 1914; and that the construction of the Behmisdeknecht patent differs from those of Pugh and Ferry patents and from a trunk piston in matters of design involving more mechanical skill."

as contrary to the evidence; see the testimony of defendants witness Stellman R. pp. 513, 515, and 516, and plaintiffs' witness Jeffries R. pp. 114 to 115, 960 and 961, and see defendants' Exhibit 4L., (the Schmiedeknecht file wrapper showing consideration of the Pugh and Ferry patents); and as contrary to the swidence cited in support of plaintiffs' Exception No. 3; sepra.

EXCEPTION NO. 35.

Plaintiffs further object and except to the failure of the Master to adopt items 1 and 2 of page 26 of plaintiffs' proposed Findings of Fact;

That the piston described and claimed in Schmiedeknecht patent No. 1,356,265 was based upon a new and original combination of elements that, coacting tegether, gave rise to a new mode of operation of the resulting piston structure, and the new combination of elements described in the Schmiedeknecht patent in suit and claimed in the claims in suit of the Schmiedeknecht patent.

ent provided the first piston atmoture embodying these elements in combination and having the
mode of operation and accomplishing the results
of the Schmiedeknecht patented piston, and no
prior art piston atmeture exhibited by defendants has the structure, mode of operation or secomplished the results of the piston described
and claimed in the Schmiedeknecht patent in
suit.

as shown by the evidence cited in support of plaintiffs' Exception No. 34, supra.

EXCEPTION NO. 36.

Plaintiffs object and except to the Master's Finding of Fact No. 34 (M. R. p. 1100) in the Master's use of the word "admission" in line 1 thereof as erroneously characterizing the whole direct Gulick testimony, R. pp. 699 to 730; and object and except to the statement and conclusion:

(a) "that such piston like Ex. 51 was not given a block test for the reason given by Gulick that he was satisfied with the previous tests " ..."

as contrary to evidence of plaintiffs' witness Guliek R. p. 734; and object and except to the statement and conclusion:

(b) "that no effort was made to place the embediments of the 1911 and 1914 pistons in the application of the Gulick patent;"

as contrary to the evidence cited in support of plaintiffs' Exception No. 7, supra, and as contrary to and irreconcilable with that part of the Master's Finding of Fast No. 12 (M. R. p. 1998) stating:

(c) "that by admission of plaintiffs' counsel, both pistons (the 1911 and 1914 pistons) ambedy the subject matter of claims 1, 4, 15, 25, 27, 28, 38, 36, 42 and 43 and Ex. 51 (the 1914 piston) additionally of claim 38." (Parenthetical inserts ours)

EXCEPTION NO. 37.

Plaintiffs object and except to the failure of the Master to find from the evidence:

(a) That the piston is the heart and vital spot of the motor and it is essential that pistons be rugged and durable; see testimony of defendants' witnesses Stellman, R. pp. 588 to 590, Dorris R. p. 1077, plaintiffs' witness Jeffries R. pp. 61, 62, 915, 936 and 962; and object and except to his failure to find:

(b) That only many thousands of miles of testing over much time can prove durability of pistons;

see defendants' deposition Exhibits D and H, and plaintiffs' Exhibit 42c, and the testimony of defendants' witness Stellman, Deposition R. pp. 451 to 457, and plaintiffs' witnesses Guliek R. pp. 802 to 310, Burns R. p. 677, Jeffries R. pp. 915, 959, 960 and 963; and object and except to his failure to find:

(c) That in 1911 and 1914 pistons were block tested and road tested in automobiles operated by engineers in the ordinary course of their business and pleasure, for many thousands of miles and over long periods of time;

see testimony of defendants' witness Stellman, Deposition R. pp. 451 to 457, and R. p. 473, Dorris R. pp. 1075 to 1076, 1082, 1083, and 1086 to 1089, and see defendants' deposition Exhibits D and H, and plaintiffs' Exhibit 42c, and the testimony of plaintiffs' witnesses Murphy R. pp. 653 and 654, Burns R. pp. 674, 676, 677, 691, to 692, Guliek R. pp. 803 to 810 and 822 to 823, and Jeffries R. pp. 914, 916 and 976, and object and except to his failure to find:

(d) That external observation of the motor, listening to the motor, observing behavior of the motor under different conditions was the common method of testing pistons in 1911 and 1914;

see testimony of Burns R. pp. 686, 691 and 692, Guliek R. pp. 809 and 810, and see Franklin Company Experimental Records, defendants' Exhibits D and H. and plaintiffs' Exhibit 42e; and object and except to his failure to find:

(e) That experimentation concludes only when pistons go into production;

see testimony of defendants' witness Dorris R. p. 1076.

EXCEPTION NO. 38.

Plaintiffs object and except to the Master's Finding of Fact No. 35 (M. R. p. 1102) and to each and every statement and conclusion thereof, comprising each of the following statements:

(a) "That the Monekmeier pistons, Exs. 3-V and 3-W, were in use by Gustave C. Monekmeier in this country in his automobile for more than two years prior to the Gulick application for patent; that such pistons embodied a T-slot disposed intermediate the wrist pin bosses with the horizontal of the T below the bottom ring land and with the vertical of the T intermediate the bosses;"

as not pleaded in defendants' answer, as immaterial and irrelevant; and as not proved beyond a reasonable doubt; see testimony of plaintiffs' witnesses, Sweet R. pp. 833, 834 and 835, Henderson R. pp. 847, 848 and 849, and Jeffries R. pp. 923 and 924, and defendants' witness D'Vorsky R. p. 332; and plaintiffs object and except to the statement and conclusion:

(b) "that such T-slotting functioned to compensate for expansion; that any reduction in head diameter to the horizontal slot involved mere mechanical skill;"

as contrary to the evidence; see testimony of defendants' witnesses Monekmeier R. pp. 305, 306 and 311, D'Vorsky R. pp. 336 and 343, and Stellman R. pp. 481, 556, 557 and 558; and see defendants' Exhibit 4-P; and the testimony of plaintiffs' witness Jeffries R. pp. 922, 923 and 924; and plaintiffs object and except to the statement and conclusion:

(c) "that such use of the Monckmeier pistons more than two years prior to the application of the Guliek patent in suit was open and not in secret but known to others and in fact public;"

as not proved beyond a reasonable doubt; see testimony of defendants' witness Monekmeier R. pp. 300, 303 and 319; and plaintiffs object and except to the statement:

(d) "that the testimony of Monekmeier and his correborating witnesses is reasonably satisfactory and reliable."

as contrary to the evidence; see the testimony of plaintiffs' witnesses, Jeffries R. pp. 921 to 924, Sweet R. pp. 834, 835, 847 and 848 (as to splits in the Monckmeier pistons) and R. pp. 833 and 834 (as to the date of change from iron to aluminum) and Henderson R. pp. 848 and 849 (as to splits in the Monckmeier pistons) and R. pp.

848 and 849 (is to date of change from iron to aluminum pistons) and Jeffries R. pp. 921 to 924; and see the sketch defendants Exhibit 4-Q (made by D'Vorsky when he saw only the aluminum pistons defendants Exhibit 3-W, R. p. 334).

EXCEPTION NO. 39.

Plaintiffs object and except to the failure of the Master to adopt items 1 to 8 inclusive, of pages 29 to 31 inclusive, of plaintiffs' Proposed Findings of Fact, summarised briefly as follows:

That the evidence does not establish beyond a reasonable doubt that Mondamier had a split shirt piston like defendants? Exhibits 3-V and 3-W, or had such pistons in public use more than two years prior to Gulick's filing date; and that such pistons as Mondamier may have made, which he claims were split, were only experimental and were abandoned; and that there is no contemporances documentary evidence showing that Mondamier ever had a split skirt piston or publicly used any split skirt piston;

see evidence cited in support of plaintiffs' Exception No. 38, supra.

EXCEPTION NO. 40.

Plaintiffs object and except to each and every statement and consumon of the Master's Finding of Fact No. 36 (M. R. p. 1102)

That for more than two years prior to the application of the putant in suit, Walter L. Schoongarth made and sold at Ironwood, Michigan, pistors of the countration above and described in the Schoongarth putant 1,174,002 but, emitting the adjusting device; that such pistons functioned to compensate for expansion; that any reduction of head diameter to circumferential slot was a matter within the purvious of a skilled machanic, and that the Schoengarth pistons were publicly med and sold in this country more than two years prior to Gulick's application for patent. That for more than two years prior to the application of the putent in suit, Walter L. Schoengarth made and sold at Ironwood, Michigan, pistons of the construction above and de-

That the testimony of Schoengarth patent 1,174,092. That the testimony of Schoengarth is reasonably corroborated, estimatory and reliable. That the emission of the adjusting devices is within the purview of any skilled mechanic."

as immaterial and irrelevant, as not proved beyond a reasonable doubt, and as contrary to the evidence; ase the testimony of defendants' withesees Schoengarth R. pp. 900, 908 and 910, Stellman, R. p. 560, and plaintiffs' witness Dr. Jeffries, R. pp. 915 to 917, 1053 and 1054.

EXCEPTION NO. 41.

Plaintiffs object and smoot to the failure of the Master to adopt all of plaintiffs' Proposed Findings of Fact, pages 32 and 33, be ify summarised as follows:

That this pisten described in the Schoenparth patent does not have the structure, mode of operation, or results of any patent in suit and only operates like and only accomplishes the results of a conventional trunk type pisten; that the pisten described in the Schoenparth patent, with the adjusting device emitted, does not have the structure, mode of operation or accomplish the results of any patent in suit;

as shown by the evidence; see the testimony of defendants' witness Dorris R. p. 1078 and plaintiffs' witness Jeffries R. pp. 915 to 917, and

that Behosagarth did not prove either public use or sale of any piston like that shown in his patent more than two years before the filing date of any patent in suit;

as shown by the evidence; see the testimony of defendants' witness Schoengarth R. pp. 900, 908 and 909.

EXCEPTION NO. 42

Plaintiffs object and except to the following statements and combinions in the Master's Finding of Fact No. 37 (M. R. pp. 1102 and 1103)

"That one Elmer C. Long, in March, 1916 exhibited to Louis Stellman and William Venner at Syracuse, New York, a six slotted piston of the construction abown by Exs. Y and A re-

spectively. That six slotted pistons of the construction shows in Exhibit A and also in Exhibit F were sold by Long to Venner while Venner was at South Bend, Indiana, as early as 1917, and that during the year, 1917, Venner cold such pistons as replacements in Franklin automobiles; and that Venner continued to sell such pistons furnished him by Long and of the construction shown in Exa. E. F. and G from 1918 to 1926. That a pisten of the construction shown in the Long patent 1395,441 with a Talot was tested at Franklin Automobile Co., at Syracuse, New York, July 1918 as admitted by plaintiff's witness, Burns. That during the year 1918. Elmer C. Long manufactured and sold sixslotted pistons of the construction shown in Exs. E, F, G and B for replacement in automobiles and that such pistons were actually used during the year, 1918 in automobiles; " " and

"That the Long pistons of 1917-1926 were successful pistons and from 1917 to 1922 were the only commercial pistons which automatically compensated for expansion."

as immeterial, as not proved beyond a reasonable doubt, as unsupported by any contemporaneous documentary evidence; and as contrary to the evidence; see testimony of defendant's witness Stellman, Deposition R. pp. 458, 459, 456, 562, 570, and Venner Deposition R. pp. 360, 361; and plaintiff's witness Murphy, R. p. 653; also see plaintiff's Exhibits Nos. 42, 43, 44 and 45; and see interference decisions plaintiff's Exhibits 67-B, pp. 1536 and 1537, 57-C. p. 1539, 69 A, p. 1550, 70-A, pp. 1566 and 1569, 70-B, p. 1571.

EXCEPTION NO. 43.

Plaintiffs object and except to the Master's failure to adopt items 1 to 3 inclusive, of page 35 of plaintiff's proposed Findings of Fact, summarised briefly as follows:—

That the evidence does not establish beyond a reasonable doubt that Long ever had any pistons like Exhibits E, F, G, R or 3-F or like the

pistons shown in his patents 1,395,441 or 1,872,772, prior to Gulick's filing date or prior to Gulick's invention or prior to Schmiedeknecht or Mooers; that priority as between Gulick and Long on issues the same as made up here was decided by all the tribunals of the Patent Office and of the courts reviewing those decisions in favor of Gulick; and that the great majority of the commercially used Long pistons were made under license under the applications from which the patents in suit eventuated.

as shown by the evidence cited in support of plaintiff's Exceptions Nos. 2, item (e) and 42.

EXCEPTION NO. 44.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 38 (M. R. p. 1104)

"That defendants' pistons, Ex. 1, BBB, CCC, 3-J,
3-O and 8 do not embody the structure, function
and mode of operation of the Gulick patent in
anit."

as contrary to the evidence; see testimony of defendants' witnesses Stellman, R. pp. 526, 527, 530, 536, 566, 567, 568, 579 and 580, Dorris, R. pp. 1070 to 1072, and Dr. Jeffries, made defendants' witness on cross examination exceeding the direct over plaintiffs' objection, R. pp. 124 and 174 as to Exhibit BBB, and plaintiffs' witness Jeffries R. pp. 82, 83, 84 and 158 to 160 as to Exhibit 1, R. pp. 124 and 190 as to Exhibit BBB, R. pp. 199 and 200 as to Exhibit CCC, R. p. 955 as to Exhibit 3-J, R. p. 956 as to Exhibit 3-O, and R. pp. 85 and 161 as to Exhibit 8.

EXCEPTION NO. 45.

Plaintiffs object and except to the failure of the Master to adopt items 3 to 8, inclusive, pages 22 and 23 of plaintiffs' Proposed Findings of Fact, summarised briefly as follows:

That each of defendants' pistons, defendants' Exhibits 1, BBB, CCC, 3-J, 3-O and 8 embody the invention claimed in each of the claims of the Gulick patent upon which plaintiffs rely and

each of said defendants' pistons have the same or substantially the same structure, function and mode of operation and accomplish the same or substantially the same results as the Gulick patented piston as defined by said claims;

as shown by the evidence cited in support of plaintiffs' Exception No. 44.

EXCEPTION NO. 46.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 39 (M.R. p. 1104)

"That defendants' pistons, Exhibits 1, BBB, CCC and 8 do not embody the structure, function and mode of operation of the Jardine patent in suit."

as contrary to the evidence; see the testimony of defendants' witness Stellman, R. pp. 566, 530, 552, 553, 579, 580, 581, 567 and 568, and Jeffries, made defendants' witness on cross examination exceeding the direct over plaintiffs' objection R. pp. 123, 194 and 173 to 175 as to Exhibit BBB, and plaintiffs' witness Jeffries, R. pp. 81 to 84 as to Exhibit I, R. pp. 190 and 199 as to Exhibit BBB, R. p. 138 as to Exhibit CCC, and R. pp. 84 to 86 as to Exhibit 8.

EXCEPTION NO. 47.

Plaintiffs object and except to the failure of the Master to adopt items 3 to 6 inclusive, page 24 of plaintiffs proposed Findings of Fact, quantities briefly as follows:

That such of defendants' pistons, defendants' Exhibits 1, B'AB, CCC, and 8 embody the invention claimed in each of the slaims of the Jardine patent appear which plaintiffs rely and each of said defendants' pistons have the same or substantially the same structure, function and made of operation and assomplish the same or substantially the same results as the Jardine patented piston as diffined by said claims.

as shown by the evidence cited in support of plaintiffs' Exception No. 46.

EXCEPTION NO. 48.

Plaintiffs object and encept to each and every statement and combinion of the Master's Finding of Fact No. 40 (M. R. p. 1104)

"That defendants' pictors, Ers. 1, BEB, CCC do not embody the structure, function and mode of operation of the Maymord patent in suit."

as contrary to the evidence; see the testimony of defeadants' vitness Stellman R. pp. 105, 100 and 105, and Dr. Jeffrich, made defeadants' vitness on class constantion, exceeding the direct over plaintiffs' objection, R. pp. 194 and 174 as to Exhibit 1998, and plaintiffs' vitness Jeffrice, R. pp. 80 to 82, 84 and 122 to 194 as to Exhibit 1, R. p. 190 as to Exhibit BBB, and R. p. 200 as to Exhibit CCC.

EXCEPTION NO. 49.

Plaintiffs object and except to the failure of the Master to adopt items 3 to 6 inclusive, page 25, of plaintiffs' Proposed Findings of Fast, summarised briefly as follows:

That each of defendants' pictons, defendants' Exhibits 1. BBB, CCC embody the invention claimed in each of the claims of the Maynard patent upon which plaintiffs rely and each of said defendants' pictons have the same or substantially the same structure, function and mode of operation and accomplish the same or substantially the same results as the Maynard patented pinton as defined by said claims.

as shown by the evidence cited in support of plaintiffs' Exception No. 48.

EXCEPTION NO. 60.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 41 (M. R. p. 1104)

"(That defendants' pistons, Exs. 1, BBB, CCC, 3.0, 8 and 9 do not embody the structure, function and mode of operation of the Mooers patent in suit."

as contrary to the evidence; see testimony of defendants' witnesses Stellman R. pp. 517, 518, 525 and 526,

Dorris R. pp. 1071 and 1072, and Jeffries, made defendants' witness on cross examination exceeding the direct over plaintiffs' objection, R. pp. 109 and 110 as to Exhibit BBB, and plaintiffs' witness Jeffries R. pp. 83, 84, 111 and 126 as to Exhibit 1, R. pp. 199 and 234 as to Exhibit BBB, R. pp. 199, 200 and 234 as to Exhibit CCC, R. pp. 206 and 267 as to Exhibit 3-O, and R. pp. 85, 86 and 112 and 113 as to Exhibits 8 and 2.

EXCEPTION NO. 51.

Plaintiffs object and except to the failure of the Master to edopt items 3 to 8 inclusive, pages 27 and 28 intiffs' proposed Findings of Fact, summarised as follows:

That each of defendants' pistons, Exhibits 1, BBB, CCC, 3-O, 8 and 9 embody the invention claimed in each of the claims of the Mooers patent upon which plaintiffs rely and each of said defendants' pictons have the same or substan-tially the same structure, function and mode of operation and accomplish the same or substantially the same results as the Mooers patented piston as defined by said claims.

as shown by the evidence cited in support of plaintiffs' Exception No. 50.

EXCEPTION NO. 82.

Plaintiffs object and except to each and every state-ent and conclusion of the Master's Findings of Fact

No. 42 (M. R. p. 1104)

"That defendants" piston, Ex. 1 does not embody
the structure, function and mode of operation
of the Schmiedeknecht patent in suit."

as contrary to the evidence; see the testimony of plaintiffs' witness Juffries R. pp. 83, 84, 115, 116 and 117.

EXCEPTION NO. 52.

Plaintiffs object and arroupt to the failure of the Master to adopt item 3 page 26 of plaintiffs' proposed Findings of Fact, summarised briefy as follows:

That defendants' piston, plaintiffs' Exhibit 1

embodies the invention plaimed in each of the

claims of the Schmiedeknecht patent upon which plaintiffs rely and said defendants' piston has the same or substantially the same structure, function and mode of operation and accomplish the same or substantially the same results as the Schmiedeknecht patented piston as defined by said claims;

as shown by the evidence cited in support of plaintiffs' Exception No. 52.

EXCEPTION NO. 54.

Plaintiffs object and except to each and every part of each of the following statements and conclusions of the Master's Finding of Fact No. 43 (M. R. p. 1104)

(a) "That the prior art requires restriction of the (Gulick) patent to the employment of webs which are of sufficient length and thinness to permit flaxing of those webs at the top of the skirt;"

as contrary to the evidence; see testimony of defendants' witness Stellman R. p. 566 and plaintiffs' witness Jeffries R. p. 952; and defendants' Exhibit 4 L, the Gulick file wrapper showing consideration of the same prior art patents here relied upon; and see plaintiffs' Exhibits 67 to 70 and 84, showing contrary findings by the Tribunals of the Patent Office and the Courts of the District of Columbia on substantially the same prior art; and see evidence cited in support of plaintiffs' Exceptions Nos. 1 and 2, supers, and excepts and objects to the following statement and conclusion:

(b) "that Exhibit 1 does not employ such charac-

as contrary to the evidence; see testimony of defendants' witness Stellman R. p. 526, and plaintiffs' witness Jeffries R. pp. 81, 82, 84, 158 to 160; and contrary to the demonstrations of the flexibility of the webs of Exhibit 1 piston before the Court by plaintiffs' witness Jeffries R. p. 954; and see evidence cited in support of plaintiffs' Exception No. 44, supes, and objects and excepts to the statements and conclusion:

(e) "that Exhibit 8 does not employ such characteristic webs; and"

as contrary to the evidence; see the testimony of defendants' witness Stellman R. p. 580 and plaintiffs' witness

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Jeffries R. pp. 84, 85 and 161; and contrary to the Findings of the Patent Office in the Interferences shown in plaintiffs Exa 67 to 70 and 84 that the Guliek patent and the Ray Day application plaintiffs Exhibit 85 embodied the same invention, see defendants Exhibit 4-L, pp. 1886 to 1918 and see evidence cited in support of plaintiffs Exception No. 44, supra; and objects and excepts to the statement and conclusion:

(d) "that Exhibits BBB and CCC " " employ no webs at all."

as contrary to the evidence cited in support of plaintiffs' Exception No. 44, supre.

EXCEPTION NO. 55.

Plaintiffs object and except to each and every part of each of the following statements and conclusions of the Master's Finding of Fact No. 44 (M. R. p. 1104)

(a) "that the prior art requires restriction of the patent (Jardine) to the employment of webs which are of sufficient lengths and thinness to permit flaxing of these webs at the top of the shirt;"

as contrary to the evidence; see testimony cited in support of plaintiffs' Exception No. 16; and excepts to the statement and conclusion.

(b) "that Ex. 1 does not ampley such characteris-

as contrary to the evidence cited under item (b) of plaintiffs' Exception No. 54, supre, and excepts to the statement that

(e) "that Ex. 8 does not employ such characteristic

as contrary to the Master's holding (M. R. p. 1104) and as contrary to the evidence cited under item (e) of plaintiffs' Exception No. 54, sepre ; and excepts to the statement

(d) "that Era BBB and CCC " " employ no webs

as contrary to the evidence cited under (d) of plaintiffs' Exception No. 54, supra.

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EXCEPTION NO. 56.

Plaintiffs object and except to the Master's Finding of Fact No. 45 (M. R. p. 1104)

"That the Maynard patent in suit describes a piston structure in which automatic compensation is not secured unless the growe E is cut into the webs F sufficiently and beyond the inside of the piston head flauge to secure web extensions at the top of sufficient length and thinness to permit flaving of these web extensions at the top of the skirt;"

as contrary to the evidence cited in support of plaintiffs' Exception No. 26, supra; and excepts to the statement and conclusion:

"that Ex. 1 does not employ such characteristic

as contrary to the evidence cited in item (b) of plaintiffs' Exception No. 54, supra; and excepts to the statement and conclusion:

as contrary to the evidence cited in item (d) of plaintiffs' Exception No. 54, supra.

EXCEPTION NO. 57.

Plaintiffs object and except to each of the following statements and conclusions of the Master's Finding of Fact No. 46 (M. R. p. 1105)

tion:"

as contrary to the evidence cited in support of plaintiffs' Exception No. 31, supro; and plaintiffs except to the statement and conclusion:

> "that in Exs. 1, BBB, CCC, 3-0, 8 and 9 the connectors are heavy and not of a structure as described in the Mooers patent and"

as ou trary to the evidence cited in support of plaintiffs' Exception No. 50, supra.

EXCEPTION NO. 58.

Plaintiffs object and except to the statement and conclusion of the Master in his Finding of Fact No. 47 (M. R. p. 1105) "that in Ex. 1 each wrist pin boss is supported intermediate its ends on the web and not as described and claimed in the Schmiedeknecht patent."

as contrary to the evidence cited in support of plaintiffs' Exception No. 52, supra

EXCEPTION NO. 59.

Plaintiffs object and except to each and every part of the following statement and conclusion of the Master's Finding of Fact No. 48 (M. R. p. 1105)

"That in Ex. 1 automatic compensation is accomplished by what has been termed the Keystone relief" and not by any web flexibility at the top:"

as contrary to the evidence cited under plaintiffs, Exceptions Nos. 44, 46, 48 and 50.

EXCEPTION NO. 60.

Plaintiffs object and except to each and every part of the following statement and conclusion of the Master's Finding of Fact No. 49 (M. R. p. 1105)

> "that such construction and arrangement does not secure the mode of operation contemplated by the Gulick and Jardine patents."

as contrary to the evidence cited in support of plaintiffs' Exceptions Nos. 44 and 46, supra.

EXCEPTION NO. 61.

Plaintiffs object and except to each of the following statements and conclusions of the Master's Finding of Fact No. 50 (M. R. p. 1105)

"That Exs. BBB and CCC do not employ any webs connecting the head with the skirt and, therefore, no webs of such flexibility as contemplated by the Guliek, Jardine and even Maynard patents, if the latter has such webs having such characteristics."

as contrary to the evidence cited in support of plaintiffs' Exceptions Nos. 41, 46, 48, 50, 54, 55 and 56,

EXCEPTION NO. 62.

Plaintiffs object and except to each and every statement and conclusion of the Master's Finding of Fact No. 51 (M. R. p. 1105)

"That defendants' pistons, Exs. 1, BBB, CCC. 3.J. 3.O. 8 and 9 employ the assential atrusture. function and mode of operation of the prior art, more particularly the Franquist patent No. 1,153,902 and Ers. 8 and 9, also the Chemard & Walcker French patent No. 468,595"

as contrary to the evidence; see the testimony of defendants' witness Stellman R. pp. 529, 530, 531, 552, 553, 584, 585 and 590 as to Exhibit 1; R. pp. 567 and 568 as to Exhibit BBB; and R. p. 528 as to Exhibit CCC and plaintiffs witness Jeffries made defendants witness on gross examination exceeding direct over plaintiff's objection R. pp. 109 and 110 and plaintiffs' witness Jeffries R. pp. 207, 208, 222 and 248.

EXCEPTIONS NOS. 63 TO 97 INC.

Plaintiffs object and except separately to each and every one of the Master's Conclusions of Law Nos. 11 to 42 inclusive, and Nos. 44 to 46, and except and object to each and every statement and conclusion therein contained and set forth as follows:

Plaintiffs' Exception No.

- "11 That the Guliek patent is invalid and void as 63 to all claims in issue.
- "12 That the Gulick patent is invalid and void as 64 to all claims in issue for want of invention.
- "13 That the Guliek patent is invalid and void as to claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 38, 42 and 43, because (a) of abandonment-at large by Guliek and plaintiff and intervening privities in title, and (b) of public use by Gulick in this country for more than two years prior to his application for patent.
- "14 That the Gulick patent is invalid and void as 66 to all claims in issue, additional to those recited in conclusion 13, (a) for want of invention over the pistons abandoned by Guliek and plaintiffs and intervening privities in title for want of invention, and (b) over the

Plaintiffs' Exception

pistons in public use by Gulick more than two years prior to his application for patent.

- 67 "15 That the Gulick patent is destroyed and invalid in toto, because (a) of the attempt to broaden the original application as against intervening rights, (b) of material changes in the specification and claims after filing, and (c) of failure to describe and claim as required by R. S. Sec. 4838.
- 68 "16 That the Gulick patent is invalid and void as to claims 1, 4, 15, 25, 27, 28, 34, 36, 38, 42 and 43 because (a) the subject matter thereof was in public use in this country by Gustave C. Monekmeier more than two years prior to Gulick's application for patent and (b) the subject matter thereof was in public use and on sale in this country by Walter L. Schoengarth more than two years prior to Gulick's application for patent.
- 69 "17 That the Gulick patent is invalid and void as to all claims in issue additional to those recited in conclusion 16, for want of invention over pistons (a) in public use in this country by Gustave C. Monckmeier more than two years prior to Gulick's application for patent, and (b) in public use and on sale in this country by Walter L. Schoengarth more than two years prior to Gulick's application for patent.
- 70 "18 That the Jardine patent is invalid and void as to all claims in issue.
- 71 "19 That the Jardine patent is invalid and void as to all claims in issue for want of invention over the prior art.
- 72 "20 That the Jardine patent is invalid as to all claims in issue because of failure to describe and claim as required by R. S. Sec. 4888.
- 73 "21 That the Maynard patent is invalid and void as to all claims in issue.
- 74 "22 That the Maynard patent is invalid and void as to all claims in issue for want of invention over the prior art.

Plaintiffs' Exception

- 75 "23 That the Maynard patent is invalid as to all claims in issue because of failure to describe and claim as required by R. S. Sec. 4888.
- 76 "24 That the Mooers patent is invalid and void as to all claims in issue.
- 77 "25 That the Mooers patent is invalid and void as to all claims in issue for want of invention over the prior art.
- "26 That the Mooers patent is destroyed and invalid in toto because (a) of the attempt to broaden the original application as against intervening rights, (b) of material changes in the specification and claims after filing, and (c) of failure to describe and claim as required by R. S. Sec. 4888.
- 79 "27 That the Schmiedeknecht patent is invalid and void as to all claims in issue.
- 80 "28 That the Schmiedeknecht patent is invalid and void as to all claims in issue for want of invention over the prior art.
- 81 "29 That the Guliek 1911 piston, Ex. 48 was abandoned to the public by Guliek, plaintiff and intervening privities in title.
- 82 "30 That the Gulick 1914 piston, Ex. 51 was abandoned to the public by Gulick, plaintiff and intervening privities in title.
- 83 "31 That the Gulick 1911 piston, Ex. 48, was in public use in this country by Gulick for more than two years prior to his application for patent.
- 84 "32 That the Gulick 1914 piston, Ex. 51, was in public use in this country by Gulick for more than two years prior to his application for patent.
- 85 "33 That the Monekmeier pistons, Exs. 3-V and 3-W were in public use in this country for more than two years prior to Guliek's application for patent.
- 86 "34 That the piston disclosure in the Schoengarth patent 1,174,092 was in public use and on sale in this country for more than two years prior to Gulick's application for patent.

Plaintiffs' Exception

- 87 "35 That a piston of the construction disclosed in the Schoengarth patent 1,174,092, but without the adjusting devices, was in public use and on sale in this country for more than two years prior to Gulick's application for patent.
- 88 "36 That the sale and use of pistons and activities in the production and development of pistons by the following parties constitute adverse and intervening rights as against Guliek, plaintiff and intervening privities in title of the Guliek patent in suit, Elmer C. Long, Gustave C. Monckmeier, Walter L. Schoengarth, Albert L. Spillman and Kant-Skore Mfg. Co., Stephen D. Hartog, Frank Jardine and Aluminum Company of America, Howard E. Maynard and Maxwell Motor Co., Ray Day, William E. Venner, W. K. Weems and Charles Chadwick.
- 89 "37 That defendants' pistons, Exs. 1, BBB, CCC, 3-J, 3-O and 8 do not infringe the Gulick patent in suit.
- 90 "38 That defendants' pistons, Ers. 1, BBB, CCC, and 8 do not infringe the Jardine patent in suit.
- 91 "39 That defendants pistons, Exs. 1, BBB and CCC do not infringe the Maynard patent in aut.
- 92. "40 That defendants' pistons, Exs. 1, BBB, CCC, 3-O, 8 and 9 do not infringe the Mooers patent in suit.
- 93 "41 That defendants' piston, Ex. 1, does not infringe the Schmiedeknecht patent in suit.
- 94 "42 That prior art not cited in the answer may be used to show want of invention, particularly as to use of expedients.
- 95 "44 That plaintiff is not entitled to the relief prayed for in the Bills of Complaint, or any part thereof.
- 96 "45 That said Bills of Complaint be dismissed."
- 97 "46 That defendants have and recover against the plaintiff the costs of suit."

and object and except to each of the foregoing Conclusions of Law as based upon erroneous findings of fact as hereinbefore specifically pointed out and as based on erroneous conclusions from the evidence referred to in the foregoing Exceptions, and as based on erroneous application of the law to the facts established by the evidence, and as based on erroneous applications of the law to the Master's Findings of Fact to which plaintiff has heretofore taken specific objections and exceptions.

EXCEPTION NO. 98.

Plaintiffs object and except to the failure of the Master to conclude as a matter of law that the acts testified to by Monckmeier with regard to the pistons, defendants' Exhibits 3-V and 3-W, constituted no more than an abandoned experiment and did not constitute any public use within the meaning or intent of the statute prior to Guliek's filing date. (For evidence see plaintiffs' Exception No. 38.)

** EXCEPTION NO. 99.

Plaintiffs object and except to the failure of the Master to conclude as a matter of law that the acts testified to by Schoengarth constituted no more than an abandoned experiment and did not constitute any public use within the meaning and intent of the statute prior to Gulick's filing date. (For evidence see plaintiffs' Exception No. 40.)

EXCEPTION NO. 100.

Plaintiffs object and except to the failure and refusal of the Master to adopt as his conclusion of law, the substance of Item 6 of page 5, of plaintiffs' proposed Conclusions of Law, in that defendants are bound by the testimony of Gulick on the cross examination, exceeding the direct examination over plaintiffs' objection, that Gulick's work prior to his filing date was experimental and never amounted to public use of any piston covered by his patent in suit. (For evidence see R. pp. 754, 755 and 768.)

EXCEPTION NO. 101.

Plaintiffs object and except to the failure and refusal of the Master to conclude as proposed by plaintiffs in Items 11, 12 and 13 on page 6, plaintiffs' proposed conclusions of law that Gulish was the original, first and sole inventor of the invention described and claimed in the Gulish patent No. 1,815,733, and that said patent is valid and sufficient in law particularly as to claims 1, 4, 11, 12, 13, 15, 16, 22, 27, 25, 29, 30, 33, 34, 35, 36, 37, 38, 41, 42 and 43, and the Gulish patent, describing and claiming a pioneer invention, is entitled to a liberal interpretation and a broad range of equivalents. (For evidence, see that cited in Exceptions Nos. 1 to 12 inc., supra.)

EXCEPTION NO. 102

Plaintiffs object and except to the failure and refusal of the Master to adopt plaintiffs' proposed conclusions of law set forth in Items 14 to 19 inclusive, pages 6 and 7 thereof, in substance that defendants have infringed the Gulick patent by the manufacture, use or sale of pistons like Defendant's Exhibits 1, 8, BBB, CCC, 3-J, 3-O, and the particular claims of the Gulick patent with reference to each exhibit as specifically set forth in plaintiffs' proposed conclusions. (For evidence, see that cited in Exceptions Nos. 44, 54, 59, 60 and 61, suppre.)

EXCEPTION NO. 108.

Plaintiffs object and except to the Master's failure and refusal to adopt the conclusion of law proposed by plaintiffs in items 1 and 2 of page 8 of their proposed conclusions of law, in substance that Jardine was the existent first, and sole inventor of the invention disclosed and claimed in Jardine patent No. 1,763,523 and that the said Jardine patent is valid and sufficient in law particularly as to claims 1 and 2 and claims 4 to 11 inclusive thereof. (For evidence, see that cited in Exceptions Nos. 3 and 14 to 18 inc., supra.)

BECEPTION NO. 104.

Plaintiffs object and except to the Master's failure and refusal to adopt the conclusion of law proposed by plaintiffs in items 3 to 6 inclusive on page 8 of their proposed conclusions, in substance that the defendants have infringed the Jardine patent No. 1,763,523 by making, using and selling, pistons like defendants' Exhibits 1, 8, BBB and CCC with respect to the claims of said patent specifically set forth with relation to each exhibit in said items of plr'ntiffs' proposed conclusions. (For syldence, see that cited in Exceptions Nos. 46, 55, 59, 60 and 61, supra.)

RECEPTION NO. 106.

Plaintiffs object and except to the Master's failure and refusal to adopt as his conclusion of law items 1 and 2 on page 9 of plaintiffs' proposed conclusions of law, in substance that Maynard was the original, first, and sole inventor of the invention described and claimed in the Maynard patent No. 1,655,968 and that the said Maynard patent is valid and sufficient in law as to all the claims thereof. (For evidence, see that sited in Exceptions Nos. 3 and 19 to 26 Inc., supra.)

EXCEPTION NO. 106.

Plaintiffs object and except to the Master's failure and refusal to adopt as a conclusion of law items 3 to 5 inclusive on page 9 of plaintiffs' proposed conclusions of law, in substance that defendants infringed the Maynard patent No. 1,656,968 by making, using and selling, pistons like defendants 'Exhibits 1, BBB and CCC with respect to the claims of said patent specifically set out with relation to each exhibit in the said items of plaintiffs' proposed conclusions. (For evidence, see that cited in Exceptions Nos. 48, 56, 59 and 61, supra.)

EXCEPTION NO. 107.

Phintiffs object and except to the Master's failure and refusal to adopt as his conclusion of law items 1 and 2 of page 10 of phintiffs' proposed conclusions of law, in existance that Moores was the original, first, and sole inventor of the invention described and claimed in the Moores patent No. 1,002,500 and that the said Moores patent is valid and originate in law as to claims 1 to 4 tashnive and 6, 8, 10 and 11 thereof. (For evidence, see that cited in Receptions Nos. 3 and 27 to 33 Inc., supra.)

PECEPTION NO. 108.

Natistific object and except to the Master's failure and refund to exact as a contraine of law items 3 to 8 industry of page 10 of plaintiffs' proposed conclusions of law, breakful to the definition of interest and editing, pistons its defendants' Entitlets 1, 2, 3, BBB, CCC and 3-O with respect to the define of said patent specifically set out with relation to each exhibit in the said items of plaintiffs' proposed conclusions. (For evidence, see that cited in Exceptions Nos. 30 and 57, supra.)

Plaintiffs object and except to the failure and refusal of the Master to adopt as his conclusion of law the substance of Items 1 and 2 on page 11 of Plaintiffs Proposed Conclusions of Law to the effect that Schmiedeknecht was the original, first and sole inventor of the invention described and claimed in the Schmiedeknecht patent No. 1,256,265, and that the said patent is valid and sufficient in law, particularly as to claims 1 and 3 thereof. (For evidence, see that cited in Exceptions Nos. 3, 34 and 35, supra.)

EXCEPTION NO. 110.

Plaintiffs object and except to the Master's failure and refusal to adopt as his conclusion of law the substance of Item 3 on page 11 of Plaintiffs' Proposed Conclusions of Law to the effect that defendants have infringed claims 1 and 3 of the Schmiedeknecht patent in suit by making, using, and selling pistons like defendants' Exhibit 1. (For evidence, see that cited in Exceptions Nos. 52 and 58, supra.)

EXCEPTION NO. 111.

Plaintiffs object and except to the failure and refusal of the Master to adopt as his conclusion of law that the plaintiffs are entitled to the relief prayed for in each Bill of Complaint, and their costs in these suits to be taxed.

And plaintiffs file their foregoing Exceptions this 26th day of February, 1934.

WM. C. McCor, F. O. BIOREY,

Solicitors for Plaintiffs.

EVANS & McCoy, RICHEY & WATTS,

Of Counsel for Plaintiffs.

Service of a copy of the foregoing, Plaintiffs' Exceptions to the Report of the Special Master, acknowledged this 26th day of February, 1934.

Kwis, Hudson & Kent, Solicitors for Defendants.

MEMORANDUM ON EXCEPTIONS TO MASTER'S

(Filed July 6, 1934.) [Case No. 4045.]

JOHES, J.:

Upon due consideration and review of the issues and matters involved and heard before the Master in these three cases, and from a consideration of the full report of the Master, and the more than ample briefs of the parties, it is the judgment of the Court that the exceptions to the report of the Master be overruled; that the findings and conclusions of the Master be approved and adopted as those of the Court; and that the report of the Master be confirmed.

The principle reasserted in the opinion of the Supreme Court in Radio Corporation of America vs. Radio Engineering Laboratories, Inc., 54 Supreme Court 752, has been noted in considering the weight to be given the earlier decisions of the Patent Office tribunals in respect of some phases of prior invention and public use. If the application of such principle is thought to be pertinent here and persuasive as against the Master's report, the eye, the understanding, and the record in the cases, in my opinion, supply the necessary weight to overcome the heavy burden cast upon the defendants.

Due exceptions may be entered for the plaintiffs, and findings and conclusions in accordance with the Master's

report may be prepared and presented.

JONES,

U. S. District Judge.

July 6th, 1934.

(Filed July 27, 1984.) [Case No. 4045.]

This cause having been referred to Wm. B. Woods, Esquire, of Cleveland, Ohio, as Special Master, by an Order of this Court made Sepember 14, 1932; said cause having come to be heard before said Special Master on the pleadings and proofs and after oral arguments made and briefs submitted by counsel for plaintiffs and counsel for defendant, said Special Master having, on January 27, 1934, reported to this Court his Findings of Fact, Conclusions of Law, and his Memorandum; and plaintiffs having filed their exceptions to the Report of the Special Master and briefs having been submitted by counsel for plaintiffs and counsel for defendant;

Thereupon, upon due consideration and review of the issues, and matters involved and heard before the Master, and from a consideration of the full Report of the Master and the briefs of the parties;

IT Is ORDERED, ADJUDGED and DECREED as follows:

T

That Plaintiffs' Exceptions to the Report of the Master be overruled; that the Findings of Fact and Conclusions of Law of the Master be approved and adopted as those of this Court, and that the Report of the Master be in all respects confirmed; but that due exceptions be entered for the plaintiffs.

That the Bill of Complaint in this cause filed by plaintiffs against defendant be, and the same hereby is, dismissed on the merits for want of equity as to each and all of the patents in suit and at plaintiffs' costs, that the costs be taxed by this Clerk of this Court and that defendant have execution therefor as at law.

Jones,

United States District Judge.

Cleveland, Ohio July 26, 1934.

Approved as to form.

Evans & McCoy, Attorneys for Plaintiffs.

Kwis, Hudeon & Kent, Attorneys for Defendant.

PETITION FOR APPRAIL

(Filed October 17, 1934.) (Case No. 4045.]

Your petitioners, the above named Plaintiffs, The Cleveland Trust Company and Chrysler Corporation, each feeling itself aggrieved by the decree made and entered herein on the 27th day of July, 1934, dismissing the above entitled cause, do hereby severally and do hereby jointly appeal from said decree to the United States Circuit Court of Appeals for the Sixth Circuit for the reasons specified in the assignment of errors which is filed herewith, and each and both pray that such appeal be allowed and that a citation issue as provided by law and that a transcript of the record, proceedings, documents and exhibits upon which said decree was based, be duly authenticated and transmitted to the United States Circuit Court of Appeals for the Sixth Circuit.

Your petitioners further pray that the amount of security to be furnished by the plaintiffs may be fixed by

the order allowing this appeal.

WM: C. McCox, F. O. RIGHEY,

> Solicitors for Plaintiffs, The Cleveland Trust Company, and Chrysler Corporation.

Service of the above petition and of the accompanying assignment of errors, and receipt of copies of the same, is acknowledged this 17th day of October, 1934.

Kwis, Hudson & Kant,

Solicitors for Defendant.

ORDER ALLOWING APPEAL.

(Entered October 17, 1934 by Paul Jones, Judge.)

[Case No. 4045.]

On petition by Plaintiffs, The Cleveland Trust Company and Chrysler Corporation, for allowance of appeal to the United States Circuit Court of Appeals for the Sixth Circuit from the decree entered in the above entitled cause on the 27th day of July, 1934, the petition is granted and it is ordered that the appeal be and the same is hereby allowed, upon giving a bond as required by law, and that a certified transcript of the record be forthwith transmitted to the United States Circuit Court of Appeals for the Sixth Circuit.

It is further ordered that the bond on appeal be

fixed at the sum of \$500.00.

JONES,

U. S. District Judge.

Cleveland, Ohio, October ..., 1934.

Service of the above order and receipt of a copy of the same is acknowledged this day of October, 1934.

Solicitors for Defendant.

ASSIGNMENT OF ERRORS.

(Filed October 17, 1934.)

[Case No. 4045.]

Now come plaintiffs, The Cleveland Trust Company and Chrysler Corporation, and present with their accompanying petition for appeal from the final decree entered herein, the following assignment of errors, which are hereinafter grouped with respect to subject matter:

GROUP A.

Assignment of errors felating to the validity of Gulick patent No. 1,815,733.

1. The Court erred in failing to find and hold the Gulick patent No. 1,815,733 good and valid in law, particularly as to claims 1, 11, 12, 13, 15, 18, 30, 33, 35, 38,

41, 42 and 43 thereof, and in failing to sustain plaintiffs' exceptions Nos. 2, 3 and 101.

- 2. The Court erred in approving and adopting the Special Master's finding of fact No. 11, and in not sustaining plaintiffs' exception (No. 1) to the following statements in the said finding of fact No. 11:
 - (a) "That the pistons of the Gulick patent embodies the fundamental structure of the Franquist patent No. 1,153,902
 - (b) and that the piston of the Franquist patent is operative to substantially compensate for expansion
 - (c) that the piston of the Gulick patent employs essentially the webs of the Spillman & Mooers patent No. 1,092,870 and of the Chenard & Walcker French patent No. 468,595
 - (d) that the web construction of the Gulick patent differentiates from those of Spillman & Mooers and Chenard & Walcker simply in matter of design involving mechanical skill
 - (e) that splitting of the skirts of the Franquist, Spillman & Mooers and Chenard & Walcker patents by through slotting was within the purview of one skilled in the art."
- The Court erred in approving and adopting the Special Master's conclusion of law No. 12,

"That the Gulick patent is invalid and void as to all claims in issue for want of invention."

and in not sustaining plaintiffs' exception No. 64 to the aforesaid conclusion of law.

4. The Court erved in approving and adopting the Special Master's conclusion of law No. 34.

"That the piston disclosure in the Schoengarth patent 1,174,092 was in public use and on sale in this country for more than two years prior to Gulick's application for patent."

and in not sustaining plaintiffs' exception (No. 86) to the aforesaid conclusion of law No. 34.

5. The Court erred in approving and adopting the Special Master's conclusion of law No. 35,

"That a piston of the construction disclosed in the Schoengarth patent 1,174,092, but without the adjusting devices, was in public use and on sale in this country for more than two years prior to Gulick's application for patent."

and in not sustaining plaintiffs' exception (No. 37) to the aforesaid conclusion of law No. 35.

6. The Court erred in approving and adopting the Special Master's conclusions of law Nos. 16 and 17, that the Gulick patent is invalid and void as to all claims in issue because of pistons

try by Walter L. Schoengarth, more than two years prior to Gulick's application for patent."

and for want of invention over such pistons, and in not sustaining plaintiffs' exceptions (Nos. 68 and 69) to the aforesaid conclusions of law Nos. 16 and 17.

7. The Court erred in approving and adopting the Special Master's finding of fact No. 36,

"That for more than two years prior to the application of the patent in suit. Walter L. Schoengarth made and sold at Ironwood, Michigan, pistons of the construction shown and described in the Schoengarth patent 1,174,092 but omitting the adjusting device; that such pistons functioned to compensate for expansion; that any reduction of head diameter to circumferential slot was a matter within the purview of a skilled mechanic; and that the Schoengarth pistons were publicly used and sold in this country more than two years prior to Gulick's application for patent. That for more than two years prior to the application of the patent in suit, Walter L. Schoengarth made and sold at Ironwood, Michigan, pistens of the construction snown 1,174,092.

scribell in the Schoengarth patent 1,174,092. That the testimony of Schoengarth is reasonably corroborated, satisfactory and reliable. That the omission of the adjusting devices is within the purview of any skilled mechanic."

and in not sustaining plaintiffs' exception (No. 40) to the aforesaid finding of fact No. 36.

8. The Court erred in approving and adopting the Special Master's finding of fact No. 35 and in not sustaining plaintiffs' exception (No. 38) to the following statements in the aforesaid finding of fact No. 35:

- (a) "That the Monekmeier pistons, Exhibits 3-V and 3-W, were in use by Gustave C. Monekmeier in this country in his automobile, for more than two years prior to the Guliek application for patent; that such pistons embodied a T-slot disposed intermediate the wrist pin bosses with the horizontal of the T below the bottom ring land and with the vertical of the T intermediate the bosses.
 - (b) that such T-slotting functioned to compensate for expansion; that any reduction in head diameter to the horizontal slot involved mere mechanical skill;
 - (c) that such use of the Monckmeier pistons more than two years prior to the application of the Gulick patent in suit was open and not in secret but known to others and in fact public; and
 - (d) that the testimony of Monckmeier and his corroborating witnesses is reasonably satisfactory and reliable."

9. The Court erred in approving and adopting the Special Master's conclusion of law No. 33:

"That the Monckmeier pistons, Exs. 3-V and 3-W were in public use in this country for more than two years prior to Gulick's application for patent."

and in not sustaining plaintiffs' exception (No. 85) to the aforesaid conclusion of law No. 33.

10. The Court erred in approving and adopting the Special Master's conclusions of law Nos. 16 and 17, that the Gulick patent is invalid and void as to all claims in issue because of pistons

tave C. Monekmeier more than two years prior to Gulick's application for patent.

and for want of invention over such pistons, and in not sustaining plaintiffs' exceptions Nos. 68 and 69 to the aforesaid conclusions of law Nos. 16 and 17.

11. The Court erred in approving and adopting the Special Master's finding of fact No. 12, and in not sustaining plaintiff's exception (No. 4) to the following statements and conclusions contained in the aforesaid finding of fact No. 12,

"That by admissions of plaintiffs' witness Gulick, Gulick abandoned and had in public use in this country during the year 1911, a piston exemplified by Exhibit 48, and during the year 1914, a piston exemplified by Exhibit 51; " "."

12. The Court erred in approving and adopting the Special Master's conclusion of law No. 31,

"That the Gulick 1911 piston, Ex. 48, was in public use in this country by Gulick for more than two years prior to his application for patent."

and in not sustaining plaintiffs' exception (No. 83) to the aforesaid conclusion of law No. 31.

13. The Court erred in approving and adopting the Special Master's conclusion of law No. 32,

"That the Gulick 1914 piston, Ex. 51, was in public use in this country by Gulick for more than two years prior to his application for patent."

and in not sustaining plaintiffs' exception (No. 84) to the aforesaid conclusion of law No. 32.

14. The Court erred in approving and adopting the statements in the Special Master's conclusions of law Nos. 13 and 14, that the Gulick patent is invalid and void as to claims 1, 4, 15, 25, 27, 28, 33, 34, 36, 38, 42 and 43, because

more than two years prior to his application for patent."

and as to all other claims in issue for want of invention over such pistons, and in not sustaining plaintiffs' exceptions (Nos. 65 and 66) to the aforesaid conclusions of law Nos. 13 and 14.

15. The Court erred in approving and adopting the Special Master's finding of fact No. 34 and in not sustaining plaintiffs' exception (No. 36) to the Special Master's use of the word 'tadmission' in his finding of fact No. 34, and to the following statement and conclusion contained in said finding of fact No. 34,

(a) " that the piston Exhibit 51 was not given a block test for the reason given by Gulick that he was satisfied with previous tests."

16. The Court erred in approving and adopting the Special Master's conclusion of law No. 15 and in not sus-

taining plaintiffs' exception (No. 67) to the following statement in the Special Master's conclusion of law No. 15:

"That the Gulick patent is destroyed and invalid in toto, because " " (c) of failure to describe and claim as required by Sec. 4888 R. S."

17. The Court erred in approving and adopting the Special Master's finding of fact No. 16.

"That the Gulick patent does not describe in sufficient detail to enable one skilled in the art to reproduce the same, the length and thickness of the webs required to secure flexibility."

and in not sustaining plaintiffs' exception (No. 11) to the aforesaid finding of fact No. 16.

18. The Court erred in approving and adopting the Special Master's conclusion of law No. 15,

"That the Guliek patent is destroyed and invalid in toto, because (a) of the attempt to broaden the original application as again intervening rights,

and in not sustaining plaintiffs' exception (No. 67) to the aforesaid conclusion of law No. 15.

19. The Court erred in approving and adopting the Special Master's finding of fact No. 34 and in not sustaining plaintiffs' exception (No. 36) to the following statement and conclusion embodied in the aforesaid finding of fact No. 34,

(b) " that no effort was made to place the embodiments of the 1911 and 1914 pistons in the application of the Guliek patent.

20. The Court erred in approving and adopting the Special Master's conclusion of law No. 29,

"That the Gulick 1911 piston, Ex. 48, was abandoned to the public by Gulick, plaintiff and intervening privities in title."

and in not sustaining plaintiffs' exception (No. 81) to the aforesaid conclusion of law No. 29.

21. The Court erred in approving and adopting the Special Master's conclusion of law No. 30:

"That the Guliek 1914 piaton, Ex. 51, was abandoned to the public by Guliek, plaintiff and intervening privities in title."

and in not sustaining plaintiffs' exception (No. 82) to the aforesaid conclusion of law No. 30.

22. The Court erred in approving and adopting the Special Master's conclusions of law Nos. 13 and 14 and in not sustaining plaintiffs' exceptions (Nos. 65 and 66) to the statements in the Special Master's conclusions of law Nos: 13 and 14, in substance that the Gulick patent is invalid and void as to the claims in issue because the Gulick invention was apandoned—at large—to the public by Gulick and plaintiffs and intervening privities in title and for want of invention over pistons abandoned by Gulick and plaintiffs and intervening privities in title.

23. The Court erred in approving and adopting the Special Master's finding of fact No. 15.

"That after the filing of the Gulick application, his application was materially modified, both as to the specification and claims without warrant therefor in the original disclosure."

and in not sustaining plaintiffs' exception (No. 9) to the aforesaid finding of fact No. 15.

34. The Court erred in approving and adopting the Special Master's conclusion of law No. 15 and in not sustaining plaintiffs' exception (No. 67) to the following holding in the Special Master's conclusion of law No. 15:

"That the Guliek patent is destroyed and invalid in toto because, " (b) of material changes in the specification and claims after filing, " "."

25. The Court erred in approving and adopting the Special Master's finding of fact No. 14,

"That the Gulick specification, while pending in the Patent Office, was broadened beyond the original disclosure while pistons were produced, used, and sold by the following parties:

Gustave C. Montkmeier
Walter L. Schoongarth
Albert L. Schoongarth
Kant-Skore Mfg. Co.
Stophen D. Hartog
Frank Jardine
Aluminum Co. of America
Howard E. Maynard
Maxwell Motor Co.
Ray Day
William E. Venner

and in not sustaining plaintiffs' exceptions (Nos. 5 and 6) to the aforesaid finding of fact No. 14.

26. The Court erred in approving and adopting the Special Master's conclusion of law No. 36,

"That the sale and use of pistons and activities in the production and development of pistons by the following parties constitute adverse and intervening rights as against Gulick, plaintiffs and intervening privities in title of the Gulick patent in suit: Elmer C. Long, Gustave C. Monckmeier, Walter L. Schoengarth, Albert L. Spillman and Kant-Skore Mfg. Co., Stephen D. Hartog, Frank Jardine and Aluminum Company of America, Howard E. Maynard and Maxwell Motor Co., Ray Day, William E. Venner, W. K. Weems and Charles Charwick."

and in not sustaining plaintiffs' exception (No. 88) to the aforesaid conclusion of law No. 36.

27. The Court erred in approving and adopting the Special Master's finding of fact No. 37 and in not sustaining the plaintiffs' exception (No. 42) to the following statements and conclusions in the Special Master's finding of fact No. 37:

"That one Elmer C. Long, in March, 1916 exhibited to Louis Stellman and William Venner at Syracuse, New York, a six slotted piston of the construction shown by Exhibits Y and A respectively. That six eletted pistons of the construction shown in Exhibit A and also in Exhibit F were sold by Long to Venner while Venner was at South Bend, Indiana, as early as 1917, and that during the year 1917 Venner sold such pistons as replacements in Franklin auto-mobiles; and that Venner continued to sell such pistons furnished him by Long and of the construction shown in Exhibits E, F and G from 1918 to 1926. That a piston of the construction shown in the Long patent 1,395,441 with a T-slot was tested at Franklin Automobile Co... at Syracuse, New York, July, 1918 as admitted by plaintiffs' witness, Burns. That during the year 1918, Elmer C. Long manufactured and sold six-slotted pistons of the construction shown in Exhibits E, F, G and B for replacement in antomobiles and that such pistons were actually

used during the year 1918 in automobiles; * * * That the Long pistons of 1917-1926 were successful pistons and from 1917 to 1922 were the only commercial pistons which automatically compensated for expansion. * * ***

GROUP B.

Assignment of errors relating to infringement of the Gulick patent in suit.

28. The Court erred in not holding that defendant has infringed the Gulick patent No. 1,815,733, particularly as to claims 1, 11, 12, 13, 15, 18, 30, 33, 35, 38, 41, 42 and 42 thereof, and in failing to sustain plaintiffs' exceptions Nos. 45 and 102.

29. The Court erred in approving and adopting the Special Master's finding of fact No. 38,

> "That defendants' pistons, Ex. 1, " do not embody the structure, function and mode of operation of the Gulick patent in suit."

and in not sustaining plaintiffs' exception (No. 44) to the aforesaid finding of fact No. 38.

30. The Court erred in approving and adopting the ial Master's finding of fact No. 43 and in not sustaining plaintiffs' exception (No. 54) to the following statements and conclusions in the aforesaid finding of fact No. 43:

- (a) " that the prior art requires restriction of the (calies) patent to the employment of webs which are of sufficient length and thiroses to partiit flexing of those webs at the top of the skirt; and
- (b) that Exhibit 1 does not employ such characteristin webs

31. The Court erred in approving and adopting the

Special Master's finding of fact No. 46.

"That in Ex. I automatic compensation is accomplished by what has been termed the 'Keystone relief' and not by any web facibility at the top; " and that such a construction and arrangement does not secure the operation contemporary that the Califet Lawline and Mayneys lated by the Gulick, Jardine and Maynard patents."

and in not sustaining plaintiffs' exception (No. 59) to the aforesaid finding of fact No. 48.

32. The Court erred in approving and adopting the Special Master's finding of fact No. 51.

"That defendants' pistons, Exs. I, " employ the essential structure, function and mode of operation of the prior art, more particularly the Franquist patent No. 1,153,902 and Exs. 8 and 9, also the Chenard & Walcker French patent No. 468,595."

and in not sustaining plaintiffs' exception (No. 62) to the aforesaid finding of fact No. 51.

33. The Court erred in approving and adopting the Special Master's conclusion of law No. 37,

"that defendant's pistons, Exs. 1, * * * do not infringe the Gulick patent in suit."

and in not systaining plaintiffs' exception (No. 89) to the aforesaid conclusion of law.

GROUP C.

Assignment of errors relating to validity of the Jardine patent No. 1,763,523.

34. The Court erred in failing to find and hold the Jardine patent No. 1,763,523 good and valid in law, particularly as to claims 1, 2, and 4 to 11, inclusive, thereof, and in failing to sastain plaintiffs' exceptions Nos. 16 and 103.

35. The Court erred in approving and adopting the Special Master's finding of fact No. 17 and in not sustaining plaintiffs' exception (No. 13) to the following statements in the Special Master's finding of fact No. 17:

- (a) "That the Jardine patent embedies the fundamental structure of Franquist patent No. 11153.902.
 - (b) that it employs constially the slipper piston structure of the Ricardo patent No. 1,254,633, and
 - (c) that the splitting of the slippers of the Ricardo patent was within the purview of one skilled in the art."
- 36. The Court erred in approving and adopting the Special Master's finding of fact No. 18,

"That the Jardine patent piston differs from the piston of the Long patent No. 1,872,772 in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 14) to the aforesaid finding of fact No. 18.

37. The Court erred in approving and adopting the Special Master's finding of fact No. 19,

"That the Jardine piston differs from the piston of the Gulick patent in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 15) to the aforesaid finding of fact No. 19.

38. The Court erred in approving and adopting the Special Master's conclusion of law No. 19,

"That the Jardine patent is invalid as to all claims in issue for want of invention over the prior art."

and in not sustaining plaintiffs' exception (No. 71) to the aforesaid conclusion of law No. 19.

39. The Court erred in approving and adopting the Special Master's finding of fact No. 20,

That the Jardine patent does not describe in sufficient detail to enable one skilled in the art to repredece the same, the length and thickness of the webs required to secure flexibility."

and in not sustaining plaintiffs' exception (No. 17) to the aforesaid finding of fact No. 20.

40. The Court erred in approving and adopting the Special Master's constanton of law No. 20,

"That the Jurdine patent is invalid as to all claims in issue because of failure to describe and claim as required by Sec. 4886 R. S."

and in not sustaining plaintiffs' exception (No. 72) to the aforesaid constnaton of law No. 20.

GROUP D.

Assignment of errors relating to infringement of Jardine patent in suit.

41. The Court erred in not holding that defendant has infringed the Jardine patent No. 1,763,523, particu-

larly as to claims 1, 2 and 4 to 11, inclusive, thereof, and in failing to sustain plaintiffs' exceptions Nos. 47 and 104.

42. The Court erred in approving and adopting the

Special Master's finding of fact No. 39,

"That defendant's pistons, Exhibit 1, do not embody the structure, function and mode of operation of the Jardine patent in suit."

and in not sustaining plaintiffs' exception (No. 46) to

the aforesaid finding of fact No. 39.

- 43. The Court erred in approving and adopting the Special Master's finding of fact No. 44 and in not sustaining plaintiffs' exception (No. 55) to the following statements and conclusions in finding of fact No. 44:
 - (a) " that the prior art requires restriction of the patent (Jardine) to the employment of webs which are of sufficient lengths and thinness to permit flexing of these webs at the top of the skirt;" and
 - (b) that Ex. 1 does not employ such characteristic webs."
- 44. The Court erred in approving and adopting the Special Master's conclusion of law No. 38,
 - "That defendants' pistons, Exs. 1, " do not infringe the Jardine patent in suit."

and in not sustaining plaintiffs' exception (No. 90) to the aforesaid conclusion of law No. 38.

GROUP E.

Assignment of errors relating to validity of the Maynard patent No. 1,655,968.

45. The Court erred in failing to find and hold the Maynard patent No. 1,655,968 good and valid in law as to all claims thereof, and in failing to sustain plaintiffs' exceptions Nos. 26 and 105.

46. The Court erred in approving and adopting the Special Master's finding of fact No. 21 and in not sustaining plaintiffs' exception (No. 19) to the following statements in the Special Master's finding of fact No. 21:

"The Maynard patent embodies the fundamental structure of the Franquist patent 756, 1,153,902, and that the splitting of the skin-by through

and through slotting was within the purview of one skilled in the art."

47. The Court erred in approving and adopting the Special Master's finding of fact No. 22.

"That the Maynard patent differs from the piston of the Jardine patent 1,763,523 in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 20) to the aforesaid finding of fact No. 22.

48. The Court erred in approving and adopting the Special Master's finding of fact No. 23,

"That the Maynard patent piston differs from the piston of the Long patent 1,395,441 in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 21) to the aforesaid finding of fact No. 23.

49. The Court erred in approving and adopting the Special Master's finding of fact No. 24.

"That the Maynard patent piston differs from the piston of the Gulick patent in matters involving mere mechanical skill."

and in not sustaining plaintffs' exception (No. 22) to the aforesaid finding of fact No. 24.

50. The Court erred in approving and adopting the Special Master's finding of fact No. 25,

"That the Maynard patent piston differs from the piston of the Schmiedeknecht patent in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 23) to the aforesaid finding of fact No. 25.

51. The Court erred in approving and adopting the Special Master's finding of fact No. 26,

"That the Maynard patent piston differs from the piston of the Ricardo patent No. 1,294,883 in matters involving mere mechanical skill."

133

and in not sustaining plaintiffs' exception (No. 24) to the aforesaid finding of fact No. 26.

52. The Court erred in approving and adopting the Special Master's finding of fact No. 27,

"That the Maynard patent piston differs from the piston of the Hives patent 140,998 in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 25) to the aforesaid finding of fact No. 27.

53. The Court erred in approving and adopting the Special Master's conclusion of law No. 22,

> "That the Maynard patent is invalid and void as to all claims in issue for want of invention over the prior art."

and in not sustaining plaintiffs' exception (No. 74) to the aforesaid conclusion of law No. 22.

54. The Court erred in approving and adopting the

Special Master's conclusion of law No. 23,

"That the Maynard patent is invalid as to all claims in issue because of failure to describe and claim as required by R. S. Sec. 4888,"

and in not sustaining plaintiffs' exception (No. 75) to the aforesaid conclusion of law No. 23.

GROUP F.

Assignment of errors relating to infringement of Maynard patent in suit.

- 55. The Court erred in failing to find and hold that defendant has infringed the Maynard patent No. 1,655,968, and in failing to sustain plaintiffs' exceptions Nos. 49 and 106.
- 56. The Court erred in approving and adopting the Special Master's finding of fact No. 40,
 - "That defendant's pistons, Ex. 1, " embody the structure, function and mode of operation of the Maynard patent in suit."

and in not sustaining plaintiffs' exception (No. 48) to the aforesaid finding of fact No. 40.

- 57. The Court erred in approving and adopting the Special Master's finding of fact No. 45 and in not sustaining plaintiffs' exception (No. 56) to the following statements in the Special Master's finding of fact No. 45:
 - (a) "That the Maynard patent in suit describes a piston structure in which automatic compensation is not secured unless the proove E is cut into the webs F sufficiently and beyond the inside of

the piston head flange to secure web extensions at the top of sufficient length and thinness to permit flexing of these web extensions at the top of the skirt; and

- (b) that Ex. 1 does not employ such characteristic webs."
- 58. The Court erred in approving and adopting the Special Master's conclusion of law No. 39,

"That the defendant's pistons, Ex. 1, " do not infringe the Maynard patent in suit."

and in not sustaining plaintiffs' exception (No. 91) to the aforesaid conclusion of law No. 39.

GROUP G.

Assignment of errors relating to validity of Mooers patent No. 1,402,309.

- 59. The Court erred in failing to find and hold that Mooers patent No. 1,402,309 is good and valid in law, particularly as to claims I to 4 inclusive, 6, 8, 10 and 11 thereof, and in failing to sustain plaintiffs' exceptions Nos. 31 and 107.
- 60. The Court erred in approving and adopting the Special Master's finding of fact No. 28,
 - "That the Mooers, patent embodies the fundamental structure of the Franquist patent No. 1,153,902 and that the employment of narrow, connectors was within the purview of one skilled in the art."

and in not sustaining plaintiffs' exception (No. 27) to the aforesaid finding of fact No. 28.

61. The Court erred in approving and adopting the Special Master's finding of fact No. 29,

"That the Mooers patent piston differs from the piston of the Spillman & Mooers patent No. 1,092,870 in suit in matters involving mere mechanical skill."

and in not sustaining plaintiffs' exception (No. 28) to the aforesaid finding of fact No. 29.

62. The Court erred in approving and adopting the Special Master's finding of fact No. 30,

"That the Mooers putent piston differs from the piston of the Chenard & Waleker patent No.

468,595 in matters involving mere mechanical

and in not sustaining plaintiffs' exception (No. 29) to / the aforesaid finding of fact No. 30.

63. The Court erred in approving and adopting the

Special Master's finding of fact No. 31;

"That the Mooers patent piston differs from the piston of the Gulick 1911 and 1914 pistons (Exhibits 48 and 51) in matters involving more mechanical skill."

and in not sustaining plaintiffs' exception (No. 30) to the aforesaid finding of fact No. 31.

64. The Court erred in approving and adopting the Special Master's conclusion of law No. 25,

"That the Mooers patent is invalid and void as to all claims in issue for want of invention over the prior art."

and in not sastaining plaintiffs' exception (No. 77) to the aforesaid conclusion of law-No. 25.

65. The Court erred in approving and adopting the Special Master's finding of fact No. 32,

"That after the filing of the Mooers application, his application was materially modified both as to specification and claims without warrant therefor in the original disclosure."

and in not sustaining plaintiff's exception (No. 32) to the aforesaid finding of fact No. 32.

66. The Court erred in approving and adopting the Special Master's conclusion of law No. 26, which is as follows:

That the Mooers patent is destroyed and invalid in toto because (a) of the attempt to broaden the original application as against intervening rights, (b) of material changes in the specification and claims after filing, and (e) of failure to describe and claim as required by Sec. 4888 B. S."

and in not sustaining plaintiffs' exception (No. 78) to the aforesaid equalization of law No. 26.

GROUP H.

Assignment of errors relating to infringement of Mooers patent in suit.

- 67. The Court erred in failing to find and hold that defendant has infringed the Mooers patent No. 1,402,309, and in failing to sustain plaintiffs' exceptions Nos. 51 and 168.
- 68. The Court erred in approving and adopting the Special Master's finding of fact No. 41.
 - "That defendant's pistons, Ex. 1, " do not embody the structure, function and mode of operation of the Mooers patent in suit."

and in not sustaining plaintiffs' exception (No. 50) to the aforesaid finding of fact No. 41.

- 69. The Court erred in approving and adopting the Special Master's finding of fact No. 46 and in not sustaining plaintiffs' exception (No. 57) to the following statements and conclusions included in the Special Master's finding of fact No. 46:
 - (a) "" that the prior art requires such a restriction; (of the connectors from the head to the top of the skirt in the Mooers patent to narrow connectors of restricted cross sections);
- 70. The Court erred in approving and adopting the Special Master's conclusion of law No. 40,
 - "That defendant's pistons, Er. 1, " " do not in-

and in not sustaining plaintiffs' exception (No. 92) to the aforesaid conclusion of law No. 40.

GROUP I.

Assignment of errors relating to the validity of .
Schmiedeknecht patent No. 1,256,265.

- 71. The Court erred in failing to find and hold the Schmiedeknecht patent No. 1,256,265 good and valid in law particularly as to claims 1 and 3 thereof, and in failing to sustain plaintiffs' exceptions Nos. 35 and 109.
- 72. The Court erred in approving and adopting the Special Master's finding of fact No. 33 and in not sus-

taining plaintiffs' exception (No. 34) to the following statements in the Special Master's finding of fact No. 33:

- (a) "That the Schmiedeknecht patent involves the fundamental structure of the Franquist patent No. 1,153,902 or of any trank pinton; and
- (b) that it employs essentially the construction and arrangement of webs and mounting of wrist pin bosses of the Pugh British patent 17,256 of 1907 and the arrangement of the webs of the Ferry British patent No. 12,772 of 1914; and that the construction of the Schmiedelmecht patent differs from those of Pugh and Ferry patents and from a trunk piston in matters of design involving mere mechanical skill."
- 73. The Court erred in approving and adopting the Special Master's conclusion of law No. 28,
 - "That the Schmiedeknecht patent is invalid and void as to all claims in issue for want of invention over the prior art."

and in not sustaining plaintiffs' exception (No. 80) to the aforesaid conclusion of law No. 28.

GROUP J.

Assignment of errors relating to infringement of the . Schmiedeknecht patent in suit.

74. The Court erred in failing to find and hold that defendant has infringed the Schmiedeknecht patent No. 1,256,265, particularly as to claims 1 and 3 thereof, and in failing to sustain plaintiffs' exceptions Nos. 53 and 110.

75. The Court erred in approving and adopting the Special Master's finding of fact No. 42,

"That defendants' piston, Ex. 1, does not embody the structure, function and mode of operation of the Schmiedeknecht patent in suit."

and in not sustaining plaintiffs' exception (No. 52) to the aforesaid finding of fact No. 42.

76. The Court erred in approving and adopting the Special Master's finding of fact No. 47, and in not sustaining plaintiffs' exception (No. 58) to the following statements and conclusions in the aforesaid finding of fact No. 47:

ported intermediate its ends on the web and not as described and claimed in the Schmiedeknecht patent."

77. The Court erred in approving and adopting the Special Master's conclusion of law No. 41,

"That defendant's piaton, Ex. 1, does not infringe the Schmiedeknecht patent in suit."

and in not sustaining plaintiffs' exception (No. 93) to the aforesaid conclusion of law No. 41.

GROUP K.

GENERAL ASSIGNMENT OF ERRORS.

- 78. The Court erred in confirming the Report of the Special Master.
- 79. The Court erred in not granting plaintiffs the relief prayed for in the Bill of Complaint. (Plaintiffs' exceptions Nos. 95 and 111.)
- 90. The Court erred in dismissing the Bill of Complaint. (Plaintiffs' exception No. 96.)
- 81. The Court erred in assessing the costs of the suit against plaintiffs. (Plaintiffs' exceptions Nos. 97 and 111.)

Wherefore, plaintiffs pray that the said decree may be reversed and for such other and further relief as to the Court may seem just and proper.

THE THEORY COME COME

F. O. RICHEY,

Solicitors for Plaintiffs, The Gleveland Trust Company and Chrysler Corporation.

Dated Oct. 17, 1934.

UNITEDA.

(Filed October 20, 1934.) [Case No. 4945.]

FOR THE BIXTH CINCUIT.

To The Schriber-Schroth Company, Greeting:

You are hereby cited and admonished to be and appear at a session of the United States Concur Court of Arrans for the States Court, to be holden at the City of Cincinnati, in said Circuit, on the 16th day of November next, pursuant to an appeal filed in the Clerk's office of the District Court of the United States for the Northern District of Ohio, wherein The Cleveland Trust Company, and the Chrysler Corporation, are appellants and you are appelled to show cause, if any there be, why the decree rendered against the said appellants as in the said petition for appeal mentioned, should not be corrected, and why speedy justice should not be done to the parties in that behalf.

Wrrams the Honorable Charles Evans Hughes, Chief Justice of the United States, this 17th day of October in the year of our Lord one thousand nine hundred and thirty-four and of the Independence of the United States of America the one hundred and fifty-ninth.

PAUL JOHES.

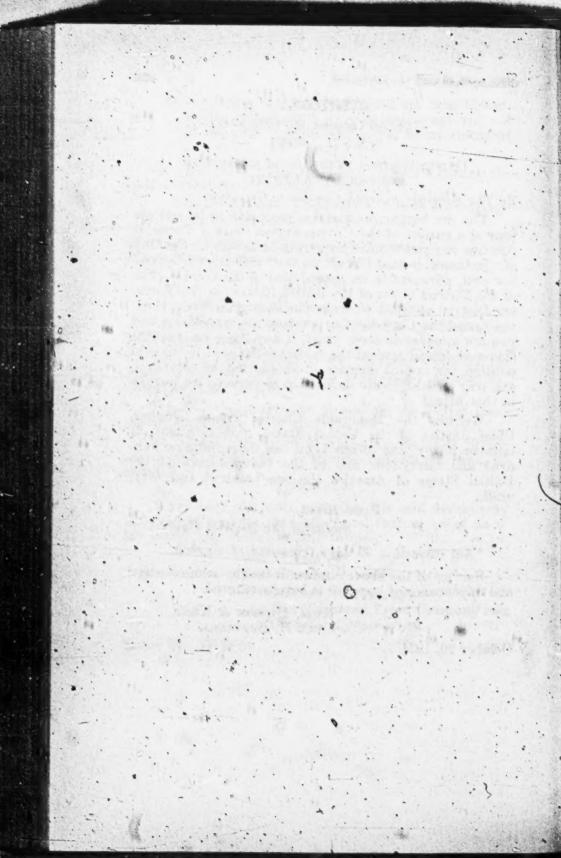
Judge of the District Court.

"Not exceeding 30 days from day of signing.

Service of the above citation is hereby acknowledged and appearance of appellee is hereby entered.

Kwis, Hubson & Kent, John H. Brunings.

October 20, 1934.



BOND ON APPEAL.

(Filed October 23, 1934.)

[Case No. 4045.].

Know All Man by Terms Passawrs, that we, The Cleveland Trust Company and Chrysler Corporation, bodies corporate, as principals, and American Surety Company of New York, 100 Broadway, New York City, a body corporate, as surety, are held and firmly bound unto The Schriber Schroth Company, of Akron, Ohio, in the full and just sum of \$500.00 to be paid to the said The Schriber Schroth Company, its certain attorneys, successors, or assigns; to which payment well and truly to be made we bind ourselves and our successors, jointly and severally with these presents. Bigned with our seals and dated this 22nd day of October, in the year of our Lord, One Thousand Nine Hundred and Thirty-four.

WHEMMAS, lately at a session of the District Court of the United States for the Eastern Division of the Northern District of Ohio, in a suit pending in said Court between The Cleveland Trust Company, Chrysler Corporation, plaintiffs, and The Schriber Schroth Company, defendant, a decree was entered against the said The Cleveland Trust Company and Chrysler Corporation, and the said plaintiffs have prosecuted an appeal in the United States Circuit Court of Appeals for the Sixth Circuit, to reverse the decree in the aforesaid suit, and a citation directed to the said The Schriber Schroth Company, citing and admonishing it to be and appear at the United States Circuit Court of Appeals for the Sixth Circuit, at Cincinnati, Ohio, within 30 days from the date of such citation.

Now, the condition of the above obligation is such that if the said The Cleveland Trust Company and Chrysler Corporation shall prosecute said appeal to effect, and answer all damages and costs if they fail to make their appeal good, then the above obligation to be void, otherwise to remain in full force and effect,

THE CLEVELAND TRUST COMPANY.

By: B. A. MADM,

Vice President.

(APPROVED FOR EXECUTION BY THE C. T. Co. EBF Ass't Counsel.)

CHATRLES CORPORATION,

By: R. A. MANN,

Vice President, The Cleveland

(APPROVED FOR EXECUTION BY THE C. T. Co. EBF

(BRAL)

Sealed and delivered in the presence of:

A. J. PROPER, F. J. HAPPHER.

> AMERICAN SURETY COMPANY OF NEW YORK, By: Eow, F. Anchen, Resident Vice President. (Seal)

Attest:

R. V. MELLENBROOK, Resident Assistant Sec'ty.

This bond is approved this 23rd day of October, 1934.

Journs,

U. S. District Judge.

Janish T. Hay

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ORDER CHARTER THEORY THEORY OF SHARE OF CHES

(Entered October 26, 1934 by Paul Jones, Judge.) [Case No. 4045.]

Pursuant to stipulation filed herein, it is ordered that the plaintiffs need not file separate narrative forms of the evidence in cases Nos. 4045, 4046 and 4047, but that it will be sufficient to file a narrative form in one cause and a reference thereto in each of the other two causes.

ORDER EXTENDING TIME FOR LODGING NARRA-TIVE STATEMENT OF EVIDENCE FILING FRANCIES AND FILING TRANSCRIPT OF REC-ORD IN U. S. GIRGUIT GOURT OF APPEALS.

(Entered October 26, 1934 by Paul Jones, Judge.)

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praccipe in the Clerk's Office be and is hereby extended to and including November 24, 1934, and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including December 16, 1984.

Jones,

United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys consent to the above Order this 25th day of October, 1934.

> Brans & McCor, Ricentr & Warm, Afternope for Plaintif. Kwn, Human & Knee,

ORDER EXTENDING THE FOR LODGING MARRA-TIVE STATEMENT OF SVIDENCE FILING PRACTICE AND FILING THE MICHIEF OF REC-ORD IN U. S. GIRGUIT GOURT OF APPEALS.

(Entered November 22, 1934 by Paul Jones, Judge.)

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praccipe in the Clerk's Office be and it hereby is extended to and including December 14, 1934, and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including December 26, 1934.

> JONES, United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 20th day of November, 1934.

Kwis, Hubson & Kent,
Attorneys for Defendant.

PRACTIPE AND LODGING WARRATIVE STATE-MENT OF EVIDENCE

(Filed December 13, 1934.)

[Case No. 40]

It is hereby stipulated by and between the parties, through their respective counsel, the Honorable Court consenting, that the time for filing the Praccipe and lodging the Narrative Statement in the above-entitled causes be extended to and including December 21, 1934.

EVANS & McCoy,

Counsel for Appellants.

Kwis, Hudson & Kunt,

Counsel for Appellees.

It is so ordered.

JOHES, United States District Judge.

Cleveland, Ohio, December 13th, 1934.

ORDER (ORANGE) STATUS VOM 12-CEDIMO 27 E 100 L TIÑO STATEMENT (ORANGE) MODELO WARRATAN TANDES (OF EVIDENCE

(Entered December 13, 1934 by Paul Jones, Judge.)

Pursant to stipulation filed herein, it is ordered that the time for filing the praccipe and ledging the narrative statement in the above causes be extended to and including Documber 21, 1934.

ORDER A TERRODICATION TORS CONCINC MARRA-TIVE POLICO TERRODICATION ASTLAND FRANCO-PELARD FILMICATA MINISTRATION OF REDORD IN U.S. GREOUT COORT OF A PRACE

(Entered December 20, 1934 by Paul Jones, Judge.)

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praccipe in the Clerk's Office be and is hereby extended to and including December 31, 1934, and

It is further ordered that the time for filing the Transcript of Becord in the United States Circuit Court of Appeals be and is hereby extended to and including January 25th, 1935.

JOHES.

United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 20th day of December, 1984.

Evans & McCor,
Attorneys for Plaintiffs.

Kwm, Humon & Kunz,
Attorneys for Defendant.

ORDER EXTENDING THE FOR LODGING WAR-- PATIVE FORM OF THE THORY AND FILING

(Entered January 2, 1905 by Paul Jones, Judge.) (Case No. 4045.)

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praccipe in the Clerk's Office be and is hereby extended to and including January 14, 1935.

Journs,

United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 31st day of December, 1934.

EVANS & McCoy, Attorneys for Plaintiffs.

Attorneys for Defendant.

WESTERN UNION

(54) 1934 Dec 31 AM 11 56

Received at 2040 East 9th St., Cleveland, Ohio AB89 21 Collect—St Louis Mo 31 1014A

Evans & McCoy— Bulkley Bldg Cleve—

Defendants in Cleveland Trust versus Aberdeen assent to extension of time for filing narrative and praccipe to January 14—

JOHN H. BRUNINGA.

(Received Dec 3 1934 Evans & McCoy.)

ORDER BYTHIDERG THE FOR LODGING MARKA-TIVE FORM OF THE TIMOSTA FIGHED PRANCE IF PARTY TAKES THAN OR STATE OF REGORD IN . U. R. GIRGUIT GOURT OF APPLAIR

(Entered January 14, 1935 by Paul Jones, Judge.)
[Case No. 4045.]

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praccipe in the Clerk's Office be and is hereby extended to and including January 28, 1935; and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including February 23, 1935.

JONES,

United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 12th day of January, 1935.

WM. C. McCor,
Attorney for Plaintiffs.
Kwm, Hubson & Kmm,
Attorneys for Defendant.

ORDER EXTENDING TIME FOR LODGING THE NAME ATIVE FORM OF TESTIMONY AND FIL-ING PRAEGIPE.

(Entered January 23, 1935 by Paul Jones, Judge.)
[Case No. 4045.]

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praccipe in the Clerk's Office be and is hereby extended to and including February 18, 1935.

Jones,

United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 22nd day of January, 1935.

EVANS AND McCox,

Attorneys for Plaintiffs.

Kwis, Hubson & Kent,

Attorneys for Defendant.

ORDER EXTENDING TIME FOR LODGING NARRA-TIVE FORM OF TESTIMONY, FILING PRAEC-IPE AND FILING TRANSCRIPT, OF RECORD IN U.S. CIRCUIT COURT OF APPRALS.

(Entered February 18, 1935 by Paul Jones, Judge.) [Case No. 4045.]

It is hereby ordered that the time for lodging the narrative form of testimony in the foregoing cause and for filing the Praecipe in the Clerk's office be and is hereby extended to and including February 25, 1935; and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including March 25, 1935.

JONES, .

United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 18th day of February, 1935.

Evans & McCov,
Attorneys for Plaintiffs.

Kwis, Hudson & Kent,

Attorneys for Defendant.

ORDER EXPENDING THE FOR

(Entered February 26, 1935 by Paul Jones, Judge.)
[Case No. 4045.]

It is hereby ordered that the time for filing the Praecipe in the Clerk's Office be and is hereby extended to and including March 15, 1935.

JOHES,

United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 25th day of February, 1935.

Evans & McCov,
Attorneys for Plaintiffs.
Kwis, Hudson & Khaz,
Attorneys for Defendant.

ORDER EXTENDING TIME FOR FILING PRAECIPE AND FOR FILING TRANSCRIPT OF RECORD IN U.S. CIECUIT COURT OF APPRAIS

(Entered March 15, 1935 by Paul Jones, Judge.)

It is hereby ordered that the time for filing the Praccipe in the Clerk's office be and is hereby extended to and including April 15, 1935; and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including April 25, 1935.

S. H. Wasz,

United States District Judge.
In absence of Judge Jones from dist.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 15th day of March, 1935.

EVANS & McCox,
Attorneys for Plaintiffs:
Kwis, Husson & Kunz,
Attorneys for Defendants.

ORDER HE VENDING THE FOR FILME PRACTURE AND FOR YILMG THANKSRIPT OF RECORD IN U.S. GERGUIT COURT OF APPRALS.

(Entered April 16, 1935 by Paul Jones, Judge.)

It is hereby ordered that the time for filing the . Practipe in the Clerk's office be and is hereby extended to and including May 6, 1935; and

It is further ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including May 16, 1935.

JOHNS,

United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 15th day of April, 1935.

Evans & McCor,
Attorneys for Plaintiffs.

Kwm, Hunson & Knnr,
Attorneys for Defendants.

ORDER EXTENDING TIME FOR FILING TRAN-SCRIPT OF RECORD IN U. S. CREGUIT COURT OF APPRAIS.

(Entered May 14, 1935 by Paul Jones, Judge.)

It is hereby ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be und is hereby extended to and including June 15th, 1985.

Jours,

United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 13th day of May, 1935.

Evans & McCox,
Attorneys for Plaintiff.
Kwis, Hudson & Kent,
Attorneys for Defendant.

ORDER STREEDING THE FOR FILING TRAN-SORIFF, OF PROOFD IN UNITED STATES OR-CULTIOGUET OF AFTERIS.

(Entered June 12, 1935 by Paul Jones, Judge.)

It is hereby ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including August 15th, 1935.

JOHES,

84.

United States District Judge.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 12th day of June, 1935:

Evans & McCor,
Attorneys for Plaintif.
Kwm, Human & Kunz,
Attorneys for Defendants.

ORDER METERORY THE TOR FILING TRAN-BULLYTOF RECORD IN UNITED STATES CIR-GUIT COURT OF AFFEATS.

(Entered July 11, 1935 by Paul Jones, Judge.)

(Case No. 4045.)

It is hereby ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including August 31st, 1935.

Subject to the consent of the Court, the parties hereto, by their attorneys, consent to the above Order this 10th day of July, 1935.

Evans & McCox,
Attorneys for Plaintiffs.
Kwis, Hubson & Krit.

Attorneys for Defendants.

ORDER EXTENDING TIME FOR FILING TRAN-SORIET OF REGORD IN DESTRUCTED STATES CIR.

(Entered August 19, 1935 by Paul Jones, Judge.) (Case No. 4045.)

It is hereby ordered that the time for filing the Transcript of Record in the United States Circuit Court of Appeals be and is hereby extended to and including September 30th, 1935.

Journ,

United States District Judge.

Subject to the coment of the Court the parties hereto, by their attorneys, coment to the above Order this 15th day of August, 1935.

Attorneys for Plaintiffs.

Kwis, Hubson & Kuur,

Attorneys for Defendent.

STIFULATION THAT APPALES IN OLUMEN MOS.

(4045-(00)-App (00)) IN DOMESTING THE OLUMEN MOS.

PLESTED TRANSMISSION OF RESERVE THAT

EXCHANGE OF GAID CAUSES AND THAT REPORT

TOWN OF SURIEAR PROBABILITY OF REAL PROPERTY.

TOWN OF SURIEAR PROBABILITY OF REAL PROPERTY.

(Filed March 2, 1935.)

[Case No. 4045.]

It is hereby stipulated by and between the respective parties to the above satisfied causes, by their counsel, as follows:

That on the appeals of the above causes the record is to be consolidated in one printed transcript of record and that the exhibits referred to therein may be used in each of said causes.

That where pleadings or other papers appear in substantially the same form in more than one case it will be sufficient to print such papers in the transcript only in one case with suitable references thereto in the other cases, reprinting in such other cases only those portions of the papers which differ from those of the first case.

Evans and MoCor,
Counsel for Appellent.
Kwm, Hussen & Kunz,
Counsel for Appelles.

It is so ordered.

8. H. W.

U. S. District Judge.

ORDER COMSOLIDATING APPRAIS IN ONE PRINT

THE PARTY OF SECTION O

SATE CANDELL SALE STREET, CONTROL THE

PERADERSE EN HAUR GAUNE.

(Entered March 2, 1985 by Publ Jones, Judge.)

[Case No. 4045.]

Purment to stipulation flied herein, it is endered that on the appeals of the above causes the record is to be constituted in one printed transcript of record and that the axhibits referred to therein may be used in each of said causes.

It is further ordered that where pleasings or other papers appear in substantially the same form is more than one case it will be sufficient to print such papers in the transcript only in one case with mitable references thereto in the other cases, reprinting is such other same only those portions of the papers which differ from those of the first case.

STATULATION ER DIGEST OF BEHINGS

(Chee No. 4045.)

It is hereby abjudited and agreed by and between courses for the parties hands, this Henoughle Court conmating that philabilly documentary exhibits as follows:

2A, 2B, 3A, 3B, SC, 3D, 4A, 4B, 4C, 4D, 8A, 5B, 5C and 5D, and diffusionly decompository exhibits as follows:

X, AA, 4B, 5-P1 to 5-P12, inclusive, 5-G, 5-H1, 5-H2, 5-H3 and 5-L, be incorporated and printed for the record

Duted: April 6,

fay 1, 1995

It is

. Parm

that plaintiffs' documentar, 2A, 2B, 3A, 3B, 5C, 3D and 5D, and defendant's lows: 4B, 4C, 4D, SA, 5B, SC mentary exhibits as fol-

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Deveryage Property

A:

O-Two paragraphs satisfied "Long Type Pistens"

Garine Mine":

H-Article cutified "The Oual Type Platen";

I-Page I and the drawing on page 2 cathiled "Drill

J. K. L. M.

N-Page 6, acticle entitled "Piston Slap" and first

O, S, T-1, T-2, T-3;

U-M. K. Weems advertisement;

W;

X—Stipulated Digest; (the stipulation)

 $\mathbf{I}_{i}\mathbf{L}_{i}$

CC. DD. BE. FF. GG, HH, II, JJ, KK, LL, MM;

on man 1881

STAL SE SC SD SE SP

4-G Page M2 to matter entitled "B. B. C. O. Storr-

AH. AI:

of Involating Materials Begun in Germany" on page

4K-Page 500 to mid of line 13 of first column on

page 660:

the the the the the

AM Article entitled "Herochell-Guillean Cross Head Photos," heduding descring entitled "The Cross

Head Plates";

4.3 Page 1001; the paragraph baginning "The plotour are of original design." first column, line 22, and ending first column, line 36, including the drawing antitled "Crean Section of Premier Motor Head Construction"

4.0 Page 85, beginning line 11 of the second col-umn to end of line 9, first column, page 86, and the drawing on page 86 entitled "The Premier-Weidely Piston":

4P, 4Q; 4B Stipulated Digest; (See stipulation)

4X, 4Y, 4Z, 5-C, 5D;

5-E From line 14, first column, beginning "Fig. 2. To prevent piston slap, preferably in," to end of line 4. of the second column, including the drawing, Fig. 2;

5-F, to 5-F, inclusive Stipulated Digest; (See stipulation)
5-G Stipulated Digest; (See stipulation)

5.H., 5-H. and 5-H. Stipulated Digest; (See stipulation)

5-I Stipulated Digest; (See stipulation)

Bill of Complaint in The Cleveland Trust Company v. The Simmons Manufacturing Company, In Equity No. 3510:

5 J. 5 K., 5-K., 5-K., 5-K., and 5-M;

31. Order for withdrawal of exhibits.

EVANS & McCox.

Counsel for Plaintiffs-Appellants.

Service of a copy acknowledged this 4th day of May, 1995

Kwis, Husson & Kust. Counsel for Defendants-Appellees.

Refresh Charleson, Login Statemen

STIPULATION RE CERTIFICATION OF RECORD. (Filed May 6, 1935.)

[Case No. 4045.]

In accordance with Section 6 of Rule 44 of the general rules of this Court, it is hereby agreed that the record as presented to the Clerk by the printer, may be certified by the Clerk as required by law soil the rules of the Appellate Court, as a true, full and complete copy of the original pleadings, papers and orders was on the trial of this cause, as set forth in the precipe for transcript, without further comparison by the Clerk.

Evans & McCor. Attorneys for Plaintiffs. Kwm, Hussen & Kurr, Attorneys for Defendant.

MINE MOTION FOR LEAVE TO AND TO THE ABOVE ENTITIED AT A STORY OF THE PARTY OF THE

(Filed May 14, 1985.) e No. **401**5.]

to in the above-entitled causes Now come defion this Court for leave to enter a above-salitied same. De-fied knowith, and litters and of which are attached ee letters are th

L. Letter of Wm. B. Woods, Special Master, dated December 30, 1923, and addressed to councel for the respective parties, reading as follows:

"In Re: The Cleveland Trust Co., Chrysler Corporation, Plaintiffs, vs. The Schriber-Schroth Co., vs. The Aberdeen Motor Supply Co., vs. The F. E. Rowe Sales Co., Defendants.

Gentlemen:

Herewith I hand you druft copy of my report as Special Master in this suit.

"If there are errors or corrections to which you would call attention, the Master will consider and make corrections insufar as he believes proper and in keeping with his views as expressed in the report. I would be obliged if I could hear from you not later than January 15th, 1984, after which time I hope to have the report in final form for filing.

"In making such auggestions, I would also be obliged if you would return your draft copy so that any changes can be made therein and it will be returned to you as the report is filed.

Yours very truly,

Wm. B. Wooss (signed)

Special Master."

To this letter defendants' counsel replied by making auggestions, many of which were adopted by the Master.

2. To this letter of the Master, plaintiff's counsel, however, replied as follows:

"In Re: The Gloveland Trust Co. Chrysler Corporation, Plaintiffs, vs. The Schröber-Schroth Co., vs. The Aberdeen Motor Supply Co., vs. The F. E. Rowe Sales Co., Defendants.

"We received the copy of your draft report in the above entitled causes and we do not believe that there are any errors or corrections in this report to which we might call your attention which would be in heeping with the views which you have expressed in your report.

"If you change any of the pages before you file the report, would you please send us copies of the amended pages that we may substitute them in the copies of the report which you sent us? Will you also advise us when the report is filed? "We are sending a copy of this letter to Mr. Bruninga.

Thanking you for your courtesies in the premises, we remain

Very truly yours,

F. O. RICHEY (signed) "WM. C. McCoy (signed)"

The above letter was written by the Special Master in pursuance to his duties as Special Master and was replied to by plaintiff's counsel in the same way and should, therefore, be a part of the record in this cause for the following reasons:

I. The Master's letter submitted a draft report and it was the duty of commel to file objections or exceptions to this draft report, at least in the form of suggestions or corrections. As was said by Judge Ray in Decker v. Smith, 225 Fed. 776 (N. D. Y. N.) Lc. 777:

The object of filing objections with the master to his draft or proposed report is to give him an opportunity to correct his report, reconsider any point objected to, and decide differently if he on reconsideration deems himself in error."

This view was affirmed by the Circuit Court of Appeals for the Eighth Circuit in American Surety Co. r. Dick,

23 F. (2d) 464, 467.

In view of the failure of plaintiff to file exceptions to the draft report there is a question of whether plaintiff has any standing; and, although this Court did not rule upon that question, the Court of Appeals can at least give the utuation consideration, particularly in view of plaintiff's 111 exceptions before this Court, and in view of what here follows:

II. Throughout the briefs before this Court plaintiff's counsel attacked the Master's Report in a manner not merely to show that the Master had committed errors of law or that his findings were not supported by the evidence, but the briefs went further, even to the extent of taking advantage of typographical errors; an example of the latter is Plaintiff's Reply Brief (pp. 21-22) as follows:

"The pother about Claim 10 of the Long patent is unnecessary and immaterial. That claim is not in the Guliek patent. The Masser, at page 85,

erroneously said that Claim 27 of Gulick was the same as Claim 10 of Long, and at page 104 of his report erroneously said that Claim 13 of Gulick was the same as Claim 10 of Long. Claim 10 of Long does not appear in the Gulick patent at all. It does not, therefore, matter that this claim reads 'word for word' upon any of the prior art, if it does. None of the Gulick claims read word for word on the prior art and even if they did, there would be no anticipation or no invalidating of the claims unless there was identity or substantial identity of operation and result."

Another example, but more mild, is found in Plaintiff's Brief (p. 3) as follows:

"It is no exaggeration, we think, to say that the learned Master has reported contrary to every one of these Patent Office Tribunals and Courts on substantially every ruling that any one of them has made during the prosecution of the applications for which, and the interferences after which the patents in suit issued."

In view of the attack by plaintiff's counsel, even in the first brief, we called the attention of this Court to the situation as noted above in Defendants' Brief (pp. 4-5), but still thereafter plaintiff's counsel insisted in the Reply Brief in even relying upon typographical

errors, as noted above.

We believe, therefore, that in order to forestall the same situation before the Court of Appeals, it is entirely proper to include in the record before the Court of Appeals the actual situation as it existed, namely, that there were no exceptions to the Master's draft Report filed by plaintiff's counsel, nor even corrections and suggestions submitted to the Master by plaintiff's counsel, but that they, in fact, informed the Master that they had none. If these letters are not in the official files as returned by the Master, they can very readily be placed in those files as the Master has them undoubtedly in his possession.

Respectfully submitted,

JOHN H. BRUNINGA, Counsel for Defendants.

St. Louis, Missouri, May 13, 1935. Service and receipt of copy of the above Motion acknowledged, this 14th day of May, 1935.

Evans & McCox, Counsel for Plaintiff

Motion denied.

Jones, Judge.

May 15, 1935.

ORDER DENYING MOTION OF DESCRIPTION OF LEAVE TO ADD TO REGORD DESCRIPTION OF DESC

(Entered May 15, 1935 by Paul Jones, Judge.) [Case No. 4045.]

This day these causes came on to be heard on the motion of the defendants for leave to add to the resord herein the defendants' counter practipe and certain letters, and were submitted to the Court; on consideration thereof the Court denied said motion.

PETITION TO SUPPLY LAST EIGHT PAGES MISS-ING FROM PLAINTIFFS' EXHIBIT 13 IN THE ABOVE CAUSE ON APPEAL.

(Filed June 18, 1935.)

[Case No. 4045.]

Now come the Plaintiffs and petition the Honorable Court for leave to supply certain pages missing from Plaintiffs' Exhibit 13 to the printer for use in preparing the Re ord for the Court of Appeals in the foregoing cause.

EVANS & McCoy,

Attorneys for Plaintiffs.

Service and a copy of the foregoing Petition acknowledged this 17 day of June, 1935.

Kwis, Hudson & Kent, Attorneys for Defendants.

Mailed with exceptions to defendants.

JONES,

Judge!

June 18, 1935.

ORDER GRANTING LEAVE TO SUPPLY LAST EIGHT PAGES OF PLAINTIFFS' EXHIBIT NO. 13.

(Entered June 18, 1935 by Paul Jones, Judge.). [Case No. 4045.]

This day these causes came on to be heard on the petition of the plaintiffs for leave to supply the last eight pages missing from Plaintiffs' Exhibit 13 to the printer for use in preparing the record for the Court of Appeals herein, and were submitted to the Court; on consideration thereof the Court granted said petition, to which ruling of the Court the defendants by their attorneys, except.

DEFENDANTS' COUNTER PRAECIPE.

(Filed June 27, 1935.) [Case No. 4045.]

To the Clerk of the Above-entitled Court:

In addition to the items called for in the Praecipe filed by plaintiff in the above-entitled case, you will please incorporate in the transcript of record for the Court of Appeals for the Sixth Circuit, the following:

- A. Petition to supply the last eight pages missing from Plaintiff's Exhibit 13 and Order granting the same but allowing exceptions to defendant—dated June 18, 1935.
- B. Letter of Wm. B. Woods, Special Master, dated December 30, 1933, and addressed to counsel for the respective parties.
- C. Letter dated January 13, 1934, addressed to Wm. B. Woods, Special Master and signed F. O. Richey and Wm. C. McCoy.
- D. Defendants' Motion for leave to add to the record in the above entitled cause the defendants' Counter Praecipe and certain letters and Order denying the same.

JOHN H. BRUNINGA,

Attorney for Defendants.

St. Louis, Mo. June 19, 1935.

ORDER SETTLING CONTENTS OF RECORD.

(Entered July 6, 1935 by Paul Jones, Judge.)
[Case No. 4045.]

On objection of Plaintiffs to items B and C of Defendants' counter practipe filed June 27, 1935, it is ordered that items B and C of Defendants' counter practipe filed June 27, 1935, be omitted from the transcript of record. Exception to Defendants.

On objection of Plaintiffs to item D of Defendants' counter praecipe filed June 27, 1935, it is ordered that the transcript of record shall contain item D of Defendants' counter praecipe filed June 27, 1935. Exception to Plaintiffs.

It is further ordered that the transcript of record shall contain item A of Defendants' counter praecipe filed June 27, 1935 and the following additional papers:

Defendants' counter praecipe filed June 27, 1935. This order.

JONES,

U. S. District Judge.

Approved:

Evans & McCov,
Attorneys for Plaintiffs.
Kwis, Hudson & Kent,

Attorneys for Defendants.

ORDER FOR WITHDRAWAL OF EXHIBITS.

(Entered September 4, 1935 by Paul Jones, Judge.)
[Case No. 4045.]

It having been represented to the Court by the parties herein that plaintiffs' Exhibits 1, 1Z, 2Z, 2Å, 2B, 3A, 3B, 3C, 3D, 4A, 4B, 4C, 4D, 5A, 5B, 5C, 5D, 8, 9, 10-A, 12, 14, 17, 20, 23, 24, 30, 34, 42A, 42B, 42C, 43, 47, 48, 49, 58, 59, 61, 71-A, 71-B, 72-A, 72-B, 73, 76, 79, 80, 81, 82, 83, and

Defendants' Exhibits A, B, E, F, G, O, P, P-1, P-2, Q, R, V₁ to V₇ inclusive, W, X, Y, AA, GG-1, HH-1, II-1, II-2, JJ-1, NN, AAA, BBB, CCC, EEE, FFF, 3-G, 3-H, 3-I, 3-J, 3-K, 3-L, 3-M, 3-N, 3-O, 3-P, 3-Q, 3-R, 3-T, 3-V, 3-W, 4-R, 5-F₁ to 5-F₁₂ inclusive, 5-G, 5-H₁, 5-H₂, 5-H₃, 5-I, 5-K₁₀, 5-L, filed in this cause, are physical exhibits or otherwise cannot be conveniently duplicated or are needed for inspection as physical exhibits in the United States Court of Appeals for the Sixth Circuit, it is hereby Ordered that the said Exhibits be withdrawn from the

files of this Court and transmitted under the supervision of the Clerk of this Court to the Clerk of the United States Court of Appeals for the Sixth Circuit at Cincinnati, Ohio, and the Clerk of this Court is hereby directed to withdraw the same from the files and supervise the packing and transmitting thereof to the Court of Appeals.

JONES,

United States District Judge.

Consented to:

WM. C. McCoy, Counsel for Plaintiffs.

John H. Bruninga, Counsel for Defendants.

STIPULATION RE CERTIFICATION OF RECORD.

(Filed May 6, 1935.) [Case No. 4045.],

In accordance with Section 6 of Rule 44 of the general rules of this Court, it is hereby agreed that the record as presented to the Clerk by the printer, may be certified by the Clerk as required by law and the rules of the Appellate Court, as a true, full and complete copy of the original pleadings, papers and orders used on the trial of this cause, as set forth in the precipe for transcript, without further comparison by the Clerk.

EVANS & McCoy,

Counsel for Plaintiffs.

Kwis, Hudson & Kent,

Counsel for Defendants.

Vol. III

TRANSCRIPT OF RECORD

Supreme Court of the United States

OCTOBER TERM, 1938

No. 3

THE SCHRIBER-SCHROTH COMPANY, PETITIONER,

925.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

No. 4

6

THE ABERDEEN MOTOR SUPPLY COMPANY, PETITIONER,

47.8

THE CLEVELAND TRUST COMPANY, CHRYSTER CORPORATION.

No. 5

THE F. E. ROWE SALES COMPANY, PETITIONER,

91.0

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

ON WRITS OF CERTIORARI TO THE UNITED STATES CIRCUIT COURT OF APPEALS FOR THE SIXTH CIRCUIT.

United States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION,

Plaintiffs-Appellants,

VS

THE SCHRIBER-SCHROTH COMPANY,

Defendant-Appellee,

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Plaintiffs-Appellants,

VB

THE ABERDEEN MOTOR SUPPLY COMPANY,

Defendant-Appellee.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Plaintiffs-Appellants,

VB.

THE F. E. ROWE SALES COMPANY,

Defendant-Appellee.

No. 4045. Equity.

No. 4046. Equity.

No. 4047. Equity.

APPEALS FROM
THE DISTRICT COURT OF THE UNITED STATES,
FOR THE NORTHERN DISTRICT OF OHIO,
EASTERN DIVISION.

TRANSCRIPT OF RECORD

VOLUME III.

Plaintiffs' Exhibits and Part of
Defendants' Exhibits.

Evans & McCoy, Bulkley Bldg., Cleveland, Ohio,

RICHEY & WATTS,
Union Trust Bldg., Cleveland, Ohio,
Attorneys for Plaintiffs-Appellants.

JOHN H. BRUNINGA, Railway Exchange Bldg., St. Louis, Missouri,

Union Trust Bldg., Cleveland, Ohio,

United States Circuit Court of Appeals

FOR THE SIXTH CIRCUIT.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION, Plaintiffs-Appellants,

No. 4045. EQUITY.

No. 4046. EQUITY.

No. 4047. EQUITY.

THE SCHRIBER-SCHROTH COMPANY, Defendant-Appellee.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

Plaintiffs-Appellants,

THE ABERDEEN MOTOR SUPPLY COMPANY, Defendant-Appellee.

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION.

Plaintiffs-Appellants,

TIE F. E. ROWE SALES COMPANY, Defendant-Appellee.

> APPEALS FROM THE DISTRICT COURT OF THE UNITED STATES, FOR THE NORTHERN DISTRICT OF OHIO, EASTERN DIVISION.

TRANSCRIPT OF RECORD

VOLUME III. Plaintiffs' Exhibits and Part of Defendants' Exhibits.

EVANS & McCoy, Bulkley Bldg., Cleveland, Ohio, RICHEY & WATTS, Union Trust Bldg., Cleveland, Ohio, Attorneys for Plaintiffs-Appellants.

JOHN H. BRUNINGA, Railway Exchange Bldg., St. Louis, Missouri,

Kwis, Hudson & Kent, Union Trust Bldg., Cleveland, Ohio,

INDEX.

VOLUME I. TRIAL PAPERS In Case No. 4045.

Caption	1
Original Bill of Complaint	. 2
Motion of Defendant, The Schriber-Schroth Company, For Further and Better Statement and Further Particulars	14
Order on Motion of Defendant, The Schriber-Schroth Company, for Further and Better Statement and Further Particulars, Overruling all but Paragraph IV B	16
Plaintiffs' Bill of Particulars	16
Petition of John H. Bruninga to Enter His Special Appearance, in Order to Enter a Special Appearance on Behalf of Sterling Products Corporation, for the Sole and Only Purpose of Objecting to the Jurisdiction.	18
Order Granting Petition of John H. Bruninga for Leave to Enter Special Appearance of Sterling Products Corpora- tion—to Object to Jurisdiction	25
Answer of Defendant, The Schriber-Schroth Company, to Bill of Complaint	26
Notice by Defendant, The Schriber-Schroth Company, of Intention to Take Depositions	41
Supplemental Notice by Defendant, The Schriber-Schroth Company, of Intention to Take Depositions, Attached to Venner et al. Depositions.	42
Notice	43
Order for Reference to and Appointment of Special Master	43
Stipulation of Plaintiff and Defendant, The Schriber-Schroth Company, Consolidating Cause No. 4045 with Causes Nos. 4046 and 4047 for Trial	45
Order Granting Stipulation Consolidating Equity Cause No. 4045 with Causes Nos. 4046 and 4047 for Trial, Etc	46
Amendment to Answer of Defendant, The Schriber-Schroth Company	48
Stipulation of Plaintiff and Defendant, The Schriber-Schroth Company, Re Narrative of Transcript	49

	_ 1			
Order Granting Stipulation of Plaintiff Schriber-Schroth Company, for Fil Testimony in one Cause with Refer of Other Two Causes.	ence Ther	eto	n Each	49
Order Approving Narrative Form of To	estimony.			. 50
Acknowledgment of Service of Narrativ	e Form of	Te	stimon	y 51
NARRATIVE FORM OF T	PRTIMON			
PLAINTIFFS' TESTI				
PLAINTIFFS TEST			Re-	Re-
	Direct Cr	oss]	Direct	Cross
W. F. Burrer	52	53		
Clarence A. Schroth		54		
F. E. Rowe		54		55
Charles W. Whitney		58		s
Zay Jeffries		90	183	208
24,		•. •	254	260
. A. J. Perfler	264 2	268		271
Plaintiffs rest				271
A. J. Perfler (Recalled)		? .	273	274
		275	***	
DEFENDANTS' TEST	IMONY.		. 1	
	Direct Cr	ross	Re- Direct	Re- Cross
Gustave C. Monckmeier	292	304		
Herbert Frank Ellingham	. 314	319		
George Ellingham		327	327	* ***
Robert W. D'Vorsky		334	341	342
			343	
Wm. M. Venner	. 9	354	367	371
Charles L. Chadwick		396		410
		• • •	412	
James V. Saxton	. 412	416	419	419

Charles F. Gilbert	400	100	400	,
Sidney D. Bevelty	420			• • •
Sidney D. Royalty	432	442	448	• • •
Louis M. Stellman		459		470
	450		471	
	472	538	573	585
	***		5,90	***
VOLUME.			. ,	
REBUTTAL TEST	TMONY.		D. '	
	Direct	Cross	Re- Direct	Re- Cross
Alisle W. Rockhoff	599	600		
R. W. Randall	602	613	619	
Fred A. Mulrine	620			
Bert E. Rockhoff	621	630	633	
Wm. H. Rockhoff	633			***
Frank U. Winchester	635	648		
Ralph Murphy	651		663	
Stephen R. Castor		667		
		001	671 672	672 673
John L. Burns		683	694	695
	. 012	000	696	698
A. H. Edgerton	698			000,
Edward J. Gulick		7.30	804	019
				813 826
C. H. Sweet	. 832	837	845	845
Jack Henderson	846	848	954	055
			OFF	-
Milton Tibbetts	859	864	894	000
Zay Jeffries	914	957	1049	1056
		. 4		1090
DEFENDANTS' SURREBUTT	AL TES	TIMON	Y	
Walter L. Schoengarth				912
George P. Domis			912	***
George P. Dorris	. 1060	1072	1082	1089

Report of William B. Woods, Special Master 1092	
teport of William B. Woods, Special Master.	,
Pleadings and Issues	
Pistons, Subject Matter of the Suit	
Claims of Patents Charged to be Infringed 1095	
Findings of Fact	
Conclusions of Law	
Memorandum:	4
Parties, Jurisdiction, Title and Joinder	
Chrysler Corporation as Party Plaintiff 1109	
Aluminum Company of America as Party Plaintiff 1111	
Venue as to Sterling Products Corporation 1113	
Claims and Defenses	
Pistons Charged to Infringe 1115	,
Trunk Pistons and Expedients 1116	
The Expired Franquist Patent	
Estoppel of Plaintiff to Deny Utility of Franquist 1122	
Presumption of Operativeness	
Utility—Operativeness	
Abandonment by Gulick of Features in Sterling Pistons Claimed to Infringe	
Statutory Abandonment	
Validity of Gulick Patent in View of Rights Intervening Before His Original Application was Broadened 1141	
Gulick 1911 and 1914 Pistons not Illustrated or Described in the Patent	
Gulick Patent Validity as Affected by Material Change in the Socification. 1150	
Mooers Patent Validity as Affected by Attempt to Broaden Original Application and Material Changes in the Specification	3
Validity of Patents over Prior Art 1153	3
Gulick Patent and Prior Art 1153	}

Invalidity or Lack of Invention	1156
Jardine Patent and Prior Art	1159
Maynard Patent and Prior Art	1161
Mooers Patent and Prior Art	1164
Schmiedeknecht and Prior Art	
Prior Uses	
Monckmeier Pistons	1166~
Schoengarth Pistons	1172
Long Pistons	1174
Infringement	
Resort to "Symptoms of Invention" So-called Upper	000
sary for Such Not Here Controlling	1182
Commercial Acceptance	
Acquiescence	1184
Prior Art not Cited in the Answer	1185
Alleged Copying by Defendants	1187
Plaintiffs' Exceptions to the Report of the Special Master	1190
Exception No. 1.	1190
Exception No. 2	1191
Exception No. 3	1192
Exception Nos. 4 and 5	1194
Exception Nos. 607 and 8	1195
Exception No. 9	1196
Exception Nos. 10, 11, 12 and 13	
Exception No. 14	1198
Exception Nos. 15 and 16:	1199
Exception Nos. 17, 18 and 19	1200
Exception Nos. 20, 21 and 22	
Exception Nos. 23, 24 and 25	
Exception Nos. 26 and 27	1203
Exception Nos. 28, 29 and 30	1904

1 00
Exception Nos. 31, 32 and 33
Exception Nos. 34 and 35
Nos 36 and 34
Exception No. 38
Exception No. 38
Nos 41 and 42
- 1' N- 49
- 11 N 44 and 45
To Nog 46 and 44
To Nos 48 49 and 50
- 11 50 and 53
To the No. 54
Exception No. 55
Exception Nos. 56, 57 and 58
Exception Nos. 59, 60 and 61
To washing No 69 and Nos. 05 to 51 Inclusive
Exception Nos. 98, 99, 100 and 101
Ftion Nos 102 103 and 104
Exception Nos. 105, 106, 107 and 108
Nos 109 110 and 111
on Exceptions to Master's Report.
Amaga Land
All mine Annoal
the state of Errors'
Group A—Assignment of Errors relating to Validity of the Gulick Patent No. 1,815,733
Group B-Assignment of Errors relating to Infringe-
Group C—Assignment of Errors relating to Validity of the Jardine Patent No. 1,763,523

I

ment of Jardine Patent in Suit
Group E—Assignment of Errors relating to Validity of Maynard Patent No. 1,655,968
Group F—Assignment of Errors relating to Infringement of Maynard Patent in Suit
Group G—Assignment of Errors relating to Validity of Mooers Patent No. 1,402,309
Group H—Assignment of Errors relating to Infringement of Mooers Patent in Suit
Group I—Assignment of Errors relating to Validity of Schmiedeknecht Patent No. 1,256,265
Group J—Assignment of Errors relating to Infringement of the Schmiedeknecht Patent in Suit 1249
Group K—General Assignment of Errors 1250
Citation
Bond on Appeal 1253
Order Granting Stipulation for Filing Narrative Form Testimony in One Cause with Reference Thereto in Each of Other Two Causes
Order Extending Time to Nov. 24, 1934 for Lodging Narrative Statement of Evidence and Filing Praecipe and to Dec. 16, 1934 for Filing Transcript of Record in U. S. Circuit Court of Appeals
Order Extending Time to Dec. 14, 1934 for Lodging Narrative Statement of Evidence and Filing Praecipe and to Dec. 26, 1934 for Filing Transcript of Record in U. S. Circuit Court of Appeals
Stipulation Extending Time to Dec. 21, 1934, for Filing Praecipe and Lodging Narrative Statement of Evidence 1257
Order Granting Stipulation Extending Time to Dec. 21, 1934 for Filing Practipe and Lodging Narrative Statement of Evidence
Order Extending Time to Dec. 31, 1934 for Lodging Narrative Form of Testimony and Filing Praecipe and to Jan. 25, 1935, for Filing Transcript of Record in U. S. Circuit Court of Appeals
Order Extending Time to Jan. 14, 1935 for Lodging Narrative Form of Testimony and Filing Practipe

Order Extending Time to Jan. 28, 1935 for Lodging Narrative Form of Testimony and Filing Praccipe and to Feb. 23, Form of Testimony and Filing Praccipe and to Feb. 23, 1935 for Filing Transcript of Record in U. S. Circuit 1935 for Filing Transcript of Record in U. S. Circuit 1259 Court of Appeals
Order Extending Time to Feb. 18, 1935 for Bodging 1260
Order Extending Time to Feb. 25, 1935 for Loughly March 25, Form of Testimony and Filing Praecipe and to March 25, 1935, for Filing Transcript of Record in U. S. Circuit 1935, for Filing Transcript of Record in U. S. Circuit
Court of Appears.
Order Extending Time to April 13, 1335 for Record in and to April 25, 1935 for Filing Transcript of Record in 1262
Order Extending Time to May 6, 1935 for Filing Transcript of Record in and to May 16, 1935 for Filing Transcript of Record in 1263
Order Extending Time to June 15, 1933 for Fining 1263
Order Extending Time to August 13, 1933 for The Court of script of Record in United States Circuit Court of 1264
Order Extending Time to August 31, 1933 101 Court of script of Record in United States Circuit Court of 1265
Order Extending Time to Sept. 30, 1933 for Court of script of Record in United States Circuit Court of 1265
Appeals Stipulation that Appeals in Causes Nos. 4045, 4046 and 4047 Stipulation that Appeals in Causes Nos. 4045, 4046 and 4047 be Consolidated in One Printed Transcript of Record, be Consolidated in One Printed Transcript of Said That Exhibits Used Therein may be Used in Each of Said
Each be Eliminated
Order Consolidating Appeals in One Printed and Deed in Record, That Exhibits Used Therein may be Used in Each of Said Causes, and Further Ordering Elimination 1267
of Repetition of Similar Fleatings 1267 Stipulation Re Digest of Exhibits
Order Granting Stipulation Re Digest

	Praecipe	1260
	Defendants' Motion for Leave to Add to the Record in the Above-Entitled Case Defendants' Counter Praccipe and Certain Letters	
	Order Denying Motion of Defendants for Leave to Add to Record Defendants' Counter Practipe and Certain	
	Letters	1277
*	Petition to Supply Last Eight Pages Missing from Plaintiffs' Exhibit 13 in the Above Cause on Appeal	1278
	Order Granting Leave to Supply Last Eight Pages of Plaintiffs' Exhibit No. 13	1278
	Defendants' Counter Praecipe	1279
,	Order Settling Contents of Record	1279
	Order for Withdrawal of Exhibits	1280
	Stipulation Re Certification of Record	1981
7		1201
	VOLUME III.	
	PLAINTIFFS' EXHIBITS.	,
	(W in last column signifies Withdrawn or Omitted)	
	Nos. Offered P	rinted
	1. Piston Manufactured by Sterling Prod- ucts Corporation and referred to in	
	Answer 51	W
		1283
	3. U. S. Patent No. 1,763,523, June 10, 1930, to F. Jardine (Patent in Suit) 51	1291
	4. U. S. Patent No. 1,655,968, Jan. 10, 1928, to H. E. Maynard (Patent in Suit) 51	1299
	5. U. S. Patent No. 1,256,265, Feb. 12, 1918, to V. E. Schmiedeknecht (Patent in Suit) 51	1305
	6. U. S. Patent No. 1,402,309, Jan. 3, 1922, to L. P. Mooers (Patent in Suit) 51	1309
	Stipulated Digest of Assignments of Patents in Suit (Offering of Assignments omitted from Narrative):	
	Gulick Patent No. 1,815,733	
	2-A. Edward J. Gulick to Packard Motor Car Co	1321

Nos.		Offered Vol. I	Printed Vol. III
2-B.	Packard, Motor Car Co. to The Cleveland Trust Co	51	1321
	Jardine Patent No. 1,763,523		
3-A.	Frank Jardine to The Aluminum Castings Co	51	1321
3-B.	The Aluminum Castings Co. to Aluminum Manufactures, Inc.	51	1321
3-C.	Aluminum Manufactures, Inc. to Aluminum Co. of America	51	1321
3-D.	Aluminum Co. of America to The Cleveland Trust Co	51	1322
	Maynard Patent No. 1,655,968		
4-A.	Howard E. Maynard to Chrysler Corporation	51	1322 1
4-B.	Chrysler Corporation to Aluminum Man- ufactures, Inc.	51	1322
4-C	Aluminum Manufactures, Inc. to Aluminum Co. of America		1322
4-D.	Aluminum Co. of America to The Cleve- land Trust Company	. 51	1322
	Schmiedeknecht Patent No. 1,256,26	5	
5-A.	Victor E. Schmiedeknecht to Frank J Kent		1323
5-B	Warranty and Guaranty by Victor E Schmiedeknecht	1.	1323
5-C.	Frank J. Kent to Bohn Aluminum and Brass Corp.	. 31	1323
5-D.	Bohn Aluminum & Brass Corp. to Th Cleveland Trust Co	e . 51	1323
7.	Instruction Sheet to Purchasers of Exhibit No. 1	. 32	1325
8.	Ray Day Piston	. 53	o W

Nos.		Offered Vol. I	Printed Vol. III
9.	Ray Day Piston	53	W
10.	Letter, March 19, 1932 to American Gear Co. from Aberdeen Motor Supply Co. (Formal Offer not included in Narra- tive)		w
10A.	Advertisement (Discussed, 53)		w
11.	Circular Letter of Sterling Products Corporation (Formal Offer not included in Narrative)		1327
12.	Poster displayed by Defendants	53	w
13.	Tabulation as to Sales Produced by Whitney	57	1328
•14.	Large Drawing of Internal Combustion Engine	61	W
15.	Drawing of Cross Section of Cylinder and Piston Wall	67	1333
16.	Drawing of Cross Section of Cylinder and Piston Wall (Magnified)	67	1335
17.	Piston Manufactured by Plaintiff's Li- censees and duplicated by Sterling Prod-		
	ucts Corp.	80	W
18.	Letter, March 24, 1932, in Reply to Exhibit No. 10 (Formal Offer not included in Narrative)		w
19.	Letter of Mr. Bruninga to F. E. Rowe (Formal Offer not included in Narra-		w-
20.	Gulick Piston	156	w ·
21.		100	, .vv
21.	Blueprint D-2376X of Defendants' 3-N Exhibit	190	1337.

In the case of Exhibits which were formally offered on pages of the Original Transcript not included in the Narrative, reference to them is made by the use of the words as "Discussed," "Identified" or "Marked for Identification" in parenthetical brackets instead of by the use of figures in the "Offered" Column of this Index.

		Offered Vol. I	Printed Vol. III
Nos.	- and a District 2 W		1
22.	Blueprint D-2460X, of Defendants' 3-M Exhibit	190	1339
23.	Large Drawing of Ray Day Pistons	190	W
24.	Double-Walled Aluminum Piston	258	W
25.	Consent Decree, Simmons Case	264	1341
26.	Conveyance, Declaration of Trust and Agreement between L. P. Mooers and George B. Pitts and The Cleveland Trust		1345
	Co., dated March 7, 1922	200	4
27.	Copy of Letter, Jan. 23, 1933, The Cleve- land Trust Co. to Chrysler Corporation (Formal Offer not included in Narra-		
	tive)		W
		Offered Vol. II	Printed Vol. III
	Bill of Sale, Amplex to Gulick	608, 617	1358
28.	Bill of Sale, Ampiez to Culick Pieton	617	1359
29.	Sketch by Randall of Gulick Piston Series of Blueprints of Gulick Motor	617	w
30.	Series of Blueprints of Guilde Motor.		
31.	Cross Section Drawing Gulick Sleeve Valve Motor	617	1361
32.	Detail of Piston of Preceding Exhibit	. 617	1363
33.	Sketch, Gulick Piston (P.X. 62)	770	· W
34.	Ebbs Physical Piston (Marked for identification, 565)	-	w
35-A.	Sketch by Winchester of Gulick Pistor (Marked for identification, 638)	n	1365
35-B.	Sketch by Winchester of Gulick Pisto (Marked for identification, 638)	n	1367
35-C.	Sketch by Winchester of Gulick Pisto (Marke For identification, 638)	n	1369
35-D.	Sketch by Winchester of Gulick Pisto (Marked for identification, 638)	n	1371
35-E.	Sketch by Winchester of Gulick Pisto (Marked for identification, 638)	n	1373
36.	Gulick 1911 Sketch (Identified, 701)	730	1375
37.	Gulick Written Description (Identifie 702)	d, 730	1377

Nos.		Offered Vol. I	Printed Vol. III
38a.	Supplemental Contract between The Cleveland Trust Co. and Aluminum Co. of America, dated April 26, 1924	282	1378
38Ъ.	License Agreement between The Cleve- land Trust Co. and Aluminum Co. of America	282	1381
	Exhibit A to License Agreement (Agreement between The Cleveland Trust Co. and Nordyke & Marmon Co., dated April 23, 1920)	282	1393
38c.	License Agreement between Walker M. Levett Co., W. M. Levett Corp., Walker M. Levett and The Cleveland Trust Co., dated April 11, 1924	282	1397
38d.	License Agreement between The National Piston Co., Gustave E. Franquist, James E. Diamond and The Cleveland Trust Co., dated April 11, 1924	282	1403
38e.	License Agreement between Kant-Skore Piston Co. and The Cleveland Trust Co., dated April 11, 1924	282	1408
-39a.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated Sept. 19, 1927	282	1412
39Ь.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated Oct. 12, 1927	283	1413
39c.	License Agreement between The Cleve- land Trust Co. and Bohn Aluminum & Brass Corp., dated Sept. 15, 1927, with Lists A and B attached	283	1414
-	List A	283	1426
	List B	283	1427
39d.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated Sept. 19, 1927	283	1428
and the same	bi		

Nos.		fered ol. I	Printed Vol. III
39e.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated April	•	
	26, 1928	283	1429
39f.	License Agreement between The Cleveland Trust Co. and Bohn Aluminum & Brass Corp., dated April 25, 1928	283	1430
39g.	Letter from Aluminum Co. of America to The Cleveland Trust Co., dated Dec. 24, 1929	283	1434
40.	Agreement between Bohn Aluminum & Brass Corporation and The Cleveland Trust Co., dated Oct. 12, 1927 under Schmiedeknecht Patent No. 1,256,265	287	1435
		Offered Vol. II	Printed Vol. III
42a.	Franklin Weekly Engineering Report for the Week Ending Oct. 5, 19186	58, 663	1438
42b.	Franklin Weekly Engineering Report for the Week Ending July 20, 19186		1439
42c.	Franklin Weekly Engineering Report for the Week Ending May 3, 19196		, n
43.	Photostat of Drawing P-2912	663	W
44.	Letter to E. C. Long from Franklin Mfg. Co., dated May 9, 1918	663	1445
45.	Letter to E. C. Long from Franklin Automobile Co., dated April 17, 1918	663	1446
44.*	Gulick Sketch Made in Court of First Sketch of 1911 (Identified, 701)	730	1447
45.*	Blueprint of Standard Excelsion Motor (Identified, 704)	730	
46.	Blueprint P-2912	693	1451
47.	Piston Used by Excelsior Motor (Identified, 705)	730	w
48.	Reproduction of Piston as Used by Excelsior (Identified, 705)	730	118
49.	Excelsior Motorcycle Piston (Identified, 709)	730	. W

Nos.		Offered Vol. II	Printed Vol. III
50.	Blueprint of Excelsior Motorcycle Piston (Identified, 709)	730	1453
51.	Gulick Sketch Made in Court of Piston made by Casting of Rockhoff	716	1455
52.	Letter, Packard Motor Car Co. to E. J. Gulick, dated Mar. 27, 1916	721	1457,
53.	Letter, E. J. Gulick to Packard Motor Car Co., dated April 1, 1916	722	1459
54.	Letter, E. J. Gulick to Packard Motor Car Co., dated Dec. 4, 1916	722	1460
55.	Letter, Packard Motor Car Co. to E. J. Gulick, dated Feb. 28, 1917.	722	1461
56.	Letter, E. J. Gulick to Packard Motor Car Co., dated May 18, 1917	722	1462
57.	Letter, E. J. Gulick to Packard Motor Car Co., dated Mar. 26, 1917	724	1463
58.	Core-box Used by Excelsion Motor & Mfg. Co.	724	w
59.	Pattern Used by Excelsior Motor & Mfg.	724	w
60.	Picture of Renault Type Car Driven by Gulick in 1911	727	1465
61.	Letter in re Above, dated Dec. 1, 1927, in re Loss of Original	727	w
62.	Gulick Exhibit No. 11 in Interferences 49,569, 49,570 and 49,571	770	1467
63.	Letter, Ray Stewart Gehr to E. J. Gulick, dated Aug. 22, 1923 (Identified, 811)		1469
34.	Letter, E. J. Gulick to Ray Stewart Gehr, dated Aug. 23, 1923 (Identified, 811)	•••	1471
35.	Gulick Deposition on Interferences 49,569, 49,570 and 49,571, pages 40 to 103, inclusive	827	1472
	Index of Exhibits showing both Interference and Transcript Numbers of Ex-		
-1	hibits		1472

		Vol. II	A OI' 111
Nos.			Led.
Edward J	.,Gulick:		1475
Direct	Examination		1501
Cross	Examination		1518
Re-Di	rect Examination		1526
Re-Cr	oss Examination		1530
Re-Di	rect Examination		1531
Re-Cr	oss Examination		1002
man C Long	e List of Applications of El g filed in Patent Office		\1532 W
December of	Long Interference No. 40,00	4	W.
67-A. Record of I	Interference of Exhibit No. 0	. 831	w
67-B. Opinion of	Examiner in Interference N	. 832	1533
	Doord in Interference N	0.	1538
.40 560			w
67D. Opinion of	the Court of Patent Appea	18 002	W
68. Record of	Interference No. 49,575		
Onlinian of	Examiner in Interference N	832	1541
40 575			1544
68-B. Opinion o	f Board in No. 49,575	ict	
68-C. Opinion o	f Court of Appeals of Distribia in Interference No. 49,5	75. 832	1546
7 3	Interference No. 49,570		W
	Examiner in Interiere	цсе	1548
No. 49,01	of Examiner of Interference once No. 49,570	s in	1551
D 1111-m	for Rehearing in Interference	ence	1554
69-B(2). Opinion	of Board in Interference	832	1556
	of the Board of Appeals in ce No. 49,570	1111-	2 1558

Printed

Offered

Nos.		Offered Vol. II	Printed Vol. III
69-C.	Opinion of the Court of Customs and Patent Appeals in Interference No. 49,570		1562 [©]
70-A;	Opinion of the Examiner in Interference No. 49,571		1565
70-В.	Opinion of the Board in Interference No. 49,571		1570
71-A.	Head Portion of Piston of Franquist	944	w
71-B.	Skirt Portion of Piston of Franquist Type	944	w
72-A.	Head Portion of Piston of Maypard Type	945	w
72-B.	Skirt Portion of Piston of Maynard Type	945	w
73.	Ricardo Type Piston	951	W
74.	Drawing Showing Dimensions of Defendants' Exhibit Monckmeier 3-V	952	1573
75.	Drawing Showing Dimensions of Defendants' Exhibit Monckmeier 3-W	952	1575
76	Ford 1933 Piston	1048	w
77.	Agreement, Aug. 4, 1917, between Mooers, Pitts, Cleveland Trust-Sawyer, Sterling-Alexander (Formal Offer not included in Narrative)	- 7	W
78.	Ditto of March 7, 1922 (Formal Offer not included in Narrative)		• W
79.	Drawing of Iron Piston Used by Dorris	1082	w-
80.	Sterling Piston with Steel Strut	1088	W
81.	Docket Entry, Gulick vs. Packard Motor	1090	W
82.	Amplex Receivership Statement of Feb. 6, 1914	1090	w
83.	Amplex Receivership Journal Entry	1090	.w
84.	Ruling of Examiner in Abandoned Application of Ray E. Day for Patent		1577
	xvii .		

Nos.	. \	Offered Vol. II	Printed Vol. III
85.	Certified Copy of the Drawings of the Abandoned Application of Ray E. Day,		
	filed January 10, 1923, Serial No. 611,698	1091	1579
86.	Patent Office Interference		W
:	DEFENDANTS' EXHIPITS.		
	V in last column signifies Withdrawn or O	mitted)	
Nos.	In last column and	Offered Vol. I	Printed Vol. III
A.	Drawing produced by Venner of Long 1916 Piston	302	1585
В.	Piston Used by Franklin	352	W
C	Two Pagraphs from Service Department Bulletin, Sheet No. 262, April 8, 1920, of Franklin Automobile Co., entitled "Long Type Pistons".	352	1587
D.	Seven paragraphs from Service Department Bulletin, Sheet No. 289, Nov. 11, 1920, of Franklin Automobile Co., entitled "New Design for Series Nine"	*	1588
E.	Piston Purchased from M. K. Weems	352	W
F.	Long 1916 Type Piston	352	W
G.	Piston Purchased from Franklin Factory		w
Н.	Article from Franklin Service Bulletin No. 348, April 18, 1932, of Franklin Au- tomobile Co., entitled "The Oval Type	259	1589
	Piston" E-arklin Service		
I.	Article from Page 1, Franklin Service Bulletin No. 369, Feb. 20, 1923, of Franklin Automobile Company, entitled "Piston and Wrist Pin Knocks," and Drawing on page 2, entitled "Drill Jig for Ex	3	
**	tra Oil Holes in Piston"	. 002	1591
J.	Forfeited and Abandoned Application of William M. Venner for Improvement in Pietons filed April 12, 1920, Serial No.	f n	1595
ā	373,340	. 354	1000

80

Nos.		Offered Vol. I	Printed Vol. III
K.	Venner Drawing, Feb. 16, 1920	354	1603
L.	Letter from George J. Oltsch to Wm. M. Venner, dated Sept. 22, 1920	354	1605
М.	Photostat of page 149, showing Cut only in "The Gasoline Automobile," by Heldt, Vol. I	368	1607
N.	Article from Pages 8 and 9 of Manual for Trouble Shooters of Franklin Automo- bile Company, entitled "Piston Slap"	372	1609
0.	Drawing produced by Chadwick, Lung 6-Slot Piston	392	1611
P(1&2)	. Core Box	392	W
Q.	Core Box	392	w
R.	Small Piston of Type made for Oldsmo- bile Car or Northway Motor	392	w
S.	Tracing of "Oldsmobile Six" Piston produced by Chadwick	392	1613
T-1.	Tracing produced by Chadwick of Long Pistons for Ford, Model T Car	392	1615
Г-2.	Tracing produced by Chadwick of Long Pistons for Essex Car	392	1617 -
Г-3.	Tracing produced by Chadwick of Long Pistons for Duesenberg Car	392	1619
υ.	Weems' Advertisement on Page 124 of "Motor Age" for July 7, 1921	392	1621
V, V-1 to	V-7. Books of the Weems Company (Marked for Identification, 385)	•••	w
W .	Photostat of Trunk Piston added to by Chadwick to show T-Slot, Long Piston	396	1623
ζ.	Digest of Defendants' Exhibit X, Agreement dated Sept. 20, 1919 between E. C. Long and M. K. Weems	407	1625
7.	Photostat of Drawing by Stellman, Long 1916 Piston (Identified, 452)	201	1627
4	L. M. Stellman's Report, dated March 18, 1919, entitled "Test on Long Pis-		
	tors"	453	1629

Nos.		Offered Vol. I	Printed Vol. III
AA.	Digest of Defendants' Exhibit AA, License Agreement dated March 20, 1919, between E. C. Long and Franklin Mfg. Co.	454	1632
CC'(1).	Blueprint D-793X of The Aluminum Castings Co. (Drawing of proposed design of piston for H. H. Franklin Mfg. Co.)	466	1633
CC'(2).	Blueprint D-944X of The Aluminum Castings Co. (Drawing of proposed design of piston for H. H. Franklin Mfg. Co.)	466	1634
CC'(3).	Castings Co. (Drawing of proposed design of piston for H. H. Franklin Mfg. Co.)	466	1635
DD.	Sketch of Long Piston seen by Royalty in 1913	435	1637
EE, P.	Sketch of Long Piston by Royalty in February, 1918	437	1638
FF.	Sketch of other views of piston shown in Exhibit EE	438	1639
GG.	Photostat of Pattern Record Card marked D-8764	413	1640
нн.	Photostat of Pattern Record Card marked A-640		1641
II.	Photostat of Pattern Record Card marked B-122	414	1642
JJ.	Photostat of Pattern Record Card marked H-4	410	1643
KK.	Photostat of Pattern Record Card marked C-123	415	1644
LL.	Card bearing notation, "Use Patt. A-640 as per instructions on core box") .	1645
MM.	Card bearing designation, "Patt. No. A-641"	400	1646
NN.	Casting		W

Nos.		Offered Vol. I	Printed · Vol. III
AAA.	Strut Type Piston (Offered as Plain- tiff's Exhibit No. 41)	591	w
BBB.	Piston, Six Cylinder Chevrolet	55	w
CCC.	Piston, Four Cylinder Chevrolet	590	w
DDD.	(No Exhibit)	. 14	
EEE.	Cut-in-half Piston like Spillman and Mooers		w
FFF.	Piston made in Permanent Mold	590	w
3-G.	Cross-section of Piston like Exhibit 1	590	o W
3-H.	Cast Iron Type Piston	590	w
3-I.	Clamping Device used as Can Opener	590	w
3-J.	T-slot Piston used in Ford 8	590	w
3-K.	Piston, Silv-O-Lite	590	·w
3-L.	Circular of Silv-Q-Lite Piston	590	W
3-M.	Willys-Overland Rough Piston Casting (Marked for Identification, 135)	• • •	w
3-N.	Oakland Rough Piston Casting (Marked for Identification, 435)		W
3-0.	T-slot Piston, Another Piston	590	w
3-P.	Small Section, Alleged Spillman and Mooers	590	w
3-Q.	Ribbed Piston, Alleged Franquist 1,153,902 Structure	590	w
3-R.	Half-Section, Gulick Piston	590	w.
3-S.	Page 274 of "The Automobile Engineer" of October, 1918, Vol. VIII, No. 119	590	1647
3-T.	Piston in Exemplification of Gulick Patent	590	w
3-U.	Letter, McCoy to J. King Harness, Dec. 30, 1932	590	w
3-V.	Monckmeier Cast Iron Split Skirt Piston	590	w
3-V'.	Kant Skore Piston	590 .	w

Was		Offered Vol. I	Printed Vol. III
Nos. 3-W.	Monckmeier Aluminum Split Skirt Piston	590	w .
3-X.	Letter, dated June 20, 1916, with Monck- meier Photo	301	1648
3-Z.*	Depositions: Venner, Chadwick, Stell- man, Royalty, Saxton, Gilbert	472	w
4-A.	Stellman Sketch of Maynard Patent Structure	. 550	1649
4-B.	Photostat of Roots Superimposed on Ebbs	590	1651
4-C.	Decision of Law Examiner, dated April 4, 1924, in Interference No. 49,569	124.0	1653
4-D.	Decision of Law Examiner, dated April 4, 1924, in Interference No. 49,574	532	1659
4-E.	Decision of Law Examiner, dated April 4, 1924, in Interference No. 49,580	532	1661
4-F.	Decision of Law Examiner, dated April 7, 1925, in Interference No. 49,575	054	1663
4-G.	Pages 362, 363 and 364 of "Automotive Industries" for Jan. 29, 1920	.001, 001	1667
4-H.	Prior Art Patents	.539, 591	
	U. S. PATENTS:		
	No. 700,309 May 20, 1902 H. E. Eb	bs	1671
-		owe	1675
**	No. 1,031,212 Jul. 2, 1912 E. Van	Bever	1679
	No 1 002 870 Apr. 14, 1914 E. O. Sp	illman s	nd 1683
	No. 1,153,902 Sept. 21, 1915 G. E. Fr	ranquist	1687
	No. 1,174,092 Mar. 7, 1916 W. L. Sc	hoengar	th. 1693
	No. 1,195,936 Aug. 22, 1916 C. White	ð	1699

Exhibit 3-Z is erroneously referred to in the Narrative, at page 472, as Exhibit 3-Y.

No. 1,229,540 June	12, 1917 E. O. Spillman 170	03
No. 1,279,184 Sept.	17, 1918 J. G. Vincent 170	
No. 1,283,021 Oct.		1
No. 1,294,833 Feb.	18, 1919 H. R. Ricardo 17	
No. 1,325,176 Dec.		
No. 1,395,441 Nov.	1, 1921 E.C. Long 172	
No. 1,489,499 Apr.		
No. 1,872,772 - Aug. 5		
Burnsi	E PATENTS:	14
No. 19,559 of 1890	James Roots 173	19
No. 17,256 of 1907	John Vernon Pugh 174	3
No. 6,826 of 1912	William Frederick Rainforth 175	1
	Samuel Octavius Ferry 175	
	Ernest Walter Hives 175	
FRENCE	PATENTS:	
No. 468,595 of 1914	Chenard and Walcker 176	3
	(Translation of foregoing). 176	
No. 434,147 of 1911	M. ChasEmile Serex 176	9
	(Translation of foregoing). 177	
No. 16,362 of 1912	M. ChasEmile Serex 177	
	(Translation of foregoing). 178	1
GERMAN	n Patent;	
No. 176,988 of 1906		5
ADDITIONAL	U. S. PATENTS:	
No. 1,557,625 Oct. 20	0, 1925 L. M. Stellmann 178	9
The state of the s	9, 1932 S. D. Hartog 179	
	4, 1924 L. H. Pomeroy 1800	
The control of the co	Charles and the	1

xxiii

		Offered Vol. I	Printed Vol. IV
Nos.		1	
5-H ₁ .	Stipulated Digest of the Decision of the Law Examiner in Interference No. 45,351	593	2279
5-H ₂ .	Stipulated Digest of the Decision of the Examiner in Interference No. 45,351	593	2279
5-H ₃ .	Stipulated Digest of the Decision of the Board of Appeals in Interference No. 45,351	593	2279
5-I.	Books of Account Pages V-1, V-2, V-4.	594	2280
	Bill of Complaint in Case No. 3510 in the U.S. District Court for the Northern District of Ohio, The Cleveland Trust Co. and Chrysler Corp. vs. The Simmons Mfg. Co. and Sterling Products Corp		2285
5-J.	Letter dated October 17, 1932 from Anna Landon Duke to J. H. Bruninga		2303
		Offered Vol. II	Printed . Vol. IV
5-K ₁ .	Letter dated May 4, 1915 from Walter L. Schoengarth to Louis Bagger & Co	899	2304
5-K2(1).	Tracing of Schoengarth Piston	899	2305
	Tracing of Schoengarth Piston	899	2307
5-K ₃ .	Three pages Description by Schoengarth of "The Adjustable Gas Engine Piston"	899	2309
5-K ₄ .	Letter dated May 13, 1915 from Louis Bagger & Co. to W. L. Schoengarth	899	2310
5-K ₅ .	Letter dated May 22, 1915 from W. L. Schoengarth to Louis Bagger & Co	899	2311
5-K4.	Letter dated May 27, 1915 from Louis Bagger & Co. to W. L. Schoengarth	899	2311
5-K,	Letter dated July 29, 1914 from W. L. Schoengarth to Louis Bagger & Co	899	2312
5-K _s .	Letter dated August 5, 1915 from Loui Bagger & Co. to W. L. Schoengarth	899	2313

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Nos.			Offered Vol. II	Printed
				Vol. IV
5-K.	Certified copy of the Schoengarth	of Application Papers of Patent No. 1,174,092	of . 899	2314
5-K ₁₀ .	Schoengarth Pi	iston	. 907	W
5-K ₁₁ .		pril 2, 1917 from Loui Walter Schoengarth		2325
5-K _{12:}		to Schoengarth at Cleve		2327
5-L.	Franquist Pisto	on Construction	. 1051	W
5-M.	List of Patents pany (Discussed	to Packard Motor Cond, 889)	í- - 1091	2329
- H		CASE NO. 4046.		
Caption				2331
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		CASE NO. 4047.		
Caption			******	2343
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Minute d Decree,	ntry of argument No. 7223 No. 7224	A. Sleth Circuit		2370 2370

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PLAINTIPPE REMISIT NO. 2.

Gulick Patent in Suit.

U. S. Patent We. 1,815,733, July 21, 1931,

To H. J. Gulick.

Piston.

(Filed January 27, 1934.)

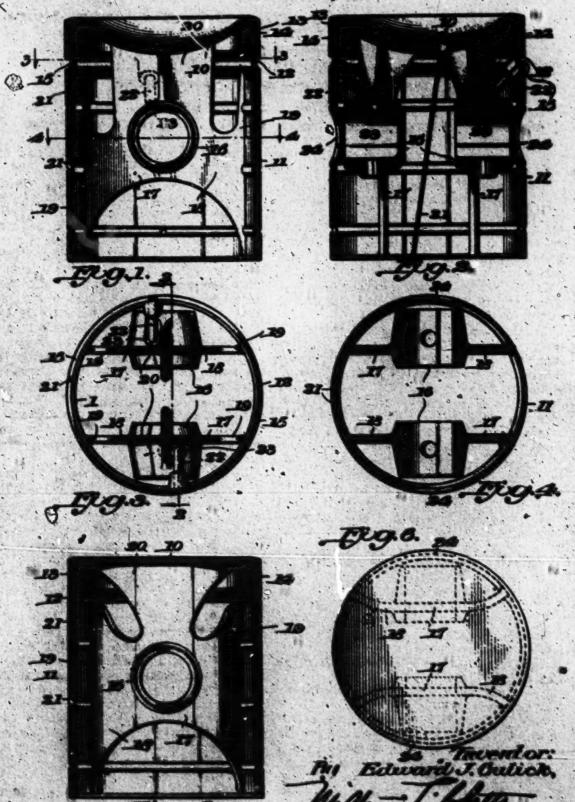
July 21, 1931.

E. J. GULICK

1,815,733

PISTON

Filed Nov. 30, 1927



UNITED STATES PATENT OFFICE

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Application and December 50, 1607. Such In picket.

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may be imported. As these openings are veralizers the bottom of the pushe portion of the picton the larger and of the picton skirt is aff underston, accept for the uplit \$1, and the arrends party of the skirt beneath mad openings may be larged upon as joining the lower once of the dismostrically opposite cylinder angular threat of the guide that contain the angular threat of the connecting rol.

I will be seen that in addition to providing a piaten with a split guide portion; the above described connection also provides a sengitualitally rigid connection between the piaten pin branes and the guide portion of the piaten, which construction may be used either with or without the split guide portion fact separated hard. The arrangement of the supporting fanges 17 between the each of the piaten pin branes and the connections of these fanges with both the piaten guide portion and the head provide a particularly strong construction, and at the same time when the longitudinal split is used, as shown its sub-directors has miffcient lateral flexibility to permit the split to close more or lateral the action of the expansion forces in which the action of the expansion forces in which the the lateral of the piaten.

rhen the longitudinal split is used, as shown, the web structure has malificient interal flexibility to permit the split to close more or less under the action of the expansion forces incident to the heating of the pieton.

In Pigs. 5 and 6 the webs or walls 16 are slightly curved between the flanges 17 and the guide pertion to thereby distribute the connection of the beause to the guide pertion parts evenly around the piston. Otherwise the showing is substantially the same as in the other forces. While my piston is, of course, adapted for use in either vigitical; inclined, or heritagetal engines, for course, and for in some instances to its head and and its open and as the upper and larger and arms ands or parts, respectively.

inds or partit respectively.

It will be understood further that my inrestion is not limited to the details of our
struction shows and other forms may be used
without departing from the spirit or stops

Having thus described my invention, what I claim and dusirs to secure by Letters Patent

I. A picton comprising a head, a skirt separcted of its periphery from the head, and pin house connected to the head and to the upper and lower parts of the skirt, and skirt shing galls improved the lay at the side between the connection to said between

the property of the same

A picken compressing a healt, a chirt supartiset at its peripher, from the head, and pin beaus connected to the head, and also connected to the aktirt hoth above and halow the brane, said aktirt being split longitudimally believes its connections to said beause

and, a skirt reperched at its periphicy from the head, and pin house integrally connected to the head and to the skirt at both sides and in the some of said bosse, the house having their each speed from the opposing parts of the skirt well, and skirt being split linguitacinally between its connections to said

An integrally cast picton comprising band, a skirt experaged picton pin town within the skirt, and an integral fange or eth of said bone, intermediate its saids and forge extending from both alter of the bone to be picton stirt and integrally saids to the picton stirt and integrally saids to the picton stirt and integrally saids the verile in the same of the bone, and fange being yieldable in the direction of the picton picton with and relatively rigid in the direction of their said relatively rigid in the direction of their saids.

The process constraint a break a start constraint as the start with the break and dispensed within the drive, and in terms of the drive, and in terms of the start and in the start and the start and

C. A picture comparising a head, a sixtic barring in puripher; especiated from the paris, the picture operand from the picture of the picture operand from the wall of the picture on the picture of the

secting around in the same of the beauty of strendilly figure the beauty to the strict on the district of the beauty to the strict on the strict portion from each of the beauty is the beauty segment the strict portion being entirely entered the strict portion and the strict portion being split longitudinally. The protein self the strict portion being split longitudinally of the protein self the strict portion being out of the present towns.

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If a pulse towning a long portion having its springer engaging part substrated from the large granders asparted pla longer laving the strict on both sides of the beauty and strict the fact on both sides of the beauty and strict the beauty of the beauty of the beauty of the strict on both sides of the beauty and strict the springer of the strict portion.

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If A plates for interest construction and contraction of the strict portion having an annular two interests surface at the open and fact the strict will be greatly portion having an annular two interests surface at the open and fact the strict will be strictly visited as a principle of the beauty portion having an annular two interests and strictly visited was principle and strictly visited was and such separated at the strictly visited was and such separated at the strictly visited was parted above and solve the place of the boar axis, said walls being displaced within the unximum dismoster of the paster, and w de passed within the district of the passes, and integral rigid our arounding from the boson to the boson to

II. A place of the second of the second the the first

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tion having an end wall and a side well, a raids portion having diamed itselfy opposite rylinder engraing parts thereof designed to ake the angular threat of a commenting rod and each experient at the upper and from the mid side wall by an air gap, a pair of separated pix brown the engaging parts, a pair of walls connected to said tower and joined to the said cylinder-engaging parts of prints above and injuries engaging parts of prints above and injuries engaging parts of prints above and injuries the plane of the boss axis and rigid integral transactions, between the boss axis and rigid integral transactions, between the boss axis and rigid integral transactions at rigid entire transactions of axis walls with attending to the boss axis and rigid integral transactions at the boss axis and rigid integral transactions are rigid.

gives comprising in combination a head porgives comprising in combination a head portion having an end wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular threat of a commeting rod and each separated at its upper end from the said side wall by an air gap, spaced supporting commetions between said lead and guide port inse, one of said cylinder-engaging parts being quit longitudinally from its upper edge to its lower edge between said expresing commetions, a pair of separated pin bosses disposed on an axis between said cylinderengaging parts, a pair of walls disposed within the maximum diameter of the places and integrally connected to said become and to said cylinder-engaging parts and to said head

It a piston for internal combination and gime comprising in combination a band portion having as and wall and a side wall, a guide portion having diametrically opposite cylinder-engaging parts thereof designed to take the angular thrust of a commetting receased each supersted at its upper and from the said wall by an air gap and one of said cylinder-engaging parts being uplit longited disably from its upper edge to its lower edge, a pair of supersted pin beams disposed on a sain between said cylinder-engaging parts and walls integrally unifing said tensor, the guide portion and the heat purties, the guide possite the split of the cylinder-engaging parts to chee many or less union the testion of the piete during operation.

them extending from the brane to the band section, one of the and official reported parts being split longitudinally between the points of attachment thereto of the said

11. In a pinton, the combination of a head portion having an one wall and a side wall, a guide portion, a pair of separated postion, and postion, and well a head postion, and well disposed longitudinally of the pastern integrally joining the inner parts of sale mass to the guide portion in the same of sale

He A pictor in internal contention or gives comprising a lead portion, a gratic portion a pair of separated plan before the sected to the head portion and stranged within the maximum discussor of the pictor whereby the outer each of the heate will be out of contact with the dylinder well and a fange on each of shall become seen in page and extending laterally from both admits the home in the guide parties in a curve to integrally united with the guide parties, in the mass of the boss, and make parties, in the mass of the boss, and form line of

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mid piston that is capacit of yielding in re-

during convition of the piston.

If A single-piece, integral piston for opention in an internal combustion engine cylinder, comprising a head, specul with pin
beaut, a longitudinally slitted das piece start
that is yields his in response to cylinder well
present having cylinder-engaging faces dispeed at opposite addes of the axis of add
conse and designed to yieldingly engage the
valls of the cylinder during operation, said
head and shirt being separated at the upper
end of each of and cylinder-engaging faces,
and mean yieldingly connecting the skirt to
add head including means connecting the
rows int the skirt said means connecting
will scarce and said chirt being substantialty rigid in the direction transverse to the
axis of the bosses, whereby said head portion may expend and contract during opsection of said piston without binding engagement of the skirt with the walls of the
cylinder.

The A situal-place, integrally case piaton for use in an engine, comprising a head, wrist pin bosses having a common axis, a skirt, and means connecting said head and houses and skirt together, said skirt being integral and having a main bearing portion disposed on each side of the said wrist pin boss axis and designed to take the side thrust produced by the angularity of the connecting

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movement relative to the head during opera-

tion of the pieton.

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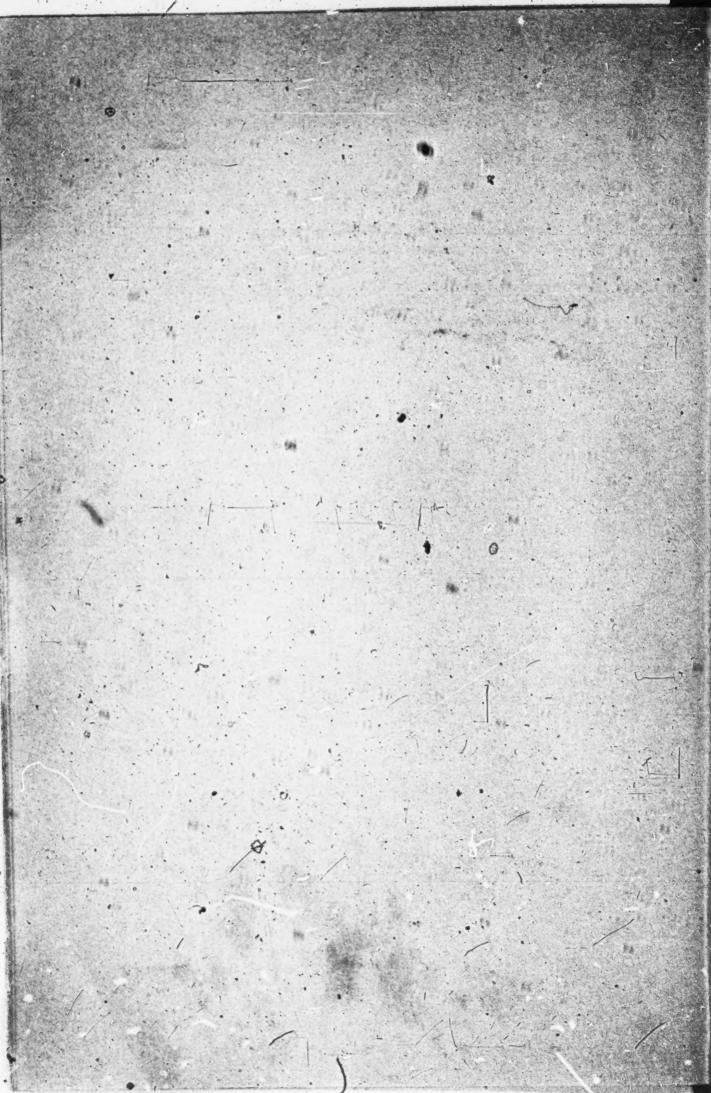
A picton for an engine cylinder comprising a least of the integral and a personal price of the integral and a personal anamedia and a personal and a personal and a personal and a persona

engine cylinder, comprising a lend sertion carrying packing manual and an engine colling packing manual and an engine colling portion fedages. With the lend portion and laving diametrically opposite cylinder and packing to read a diametrically opposite to read a diametrically and case of said cylinder engaging parts being the length of the product of manual and packing the manual and product of manual and packing the manual and product of manual and packing the colling of manual and packing the colling of the c

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CHATTE CATE OF CORRECTION. Greated July 21, 1901, 66 Patent No. 1,815,733. EDWARD & GULICK. It is income certified that error appears to the printed specification of the above numbered patent oraquiring correction as follows. Page 5, line 33, civile 39, for the word "expecting" read and expected; and that the said Letters Pole est about he read with this correction therein that the same may conform to the record of the case in the Petens Office.

Signed and essied this 22ml day of September, A. D. 1931. (Seal) A service of the serv



PLAINTIFFS' EXHIBIT NO. 3.

Jardine Patent in Suit.

U. 8. Patent No. 1,763,523, June 10, 1930,

To F. Jardine.

Piston.

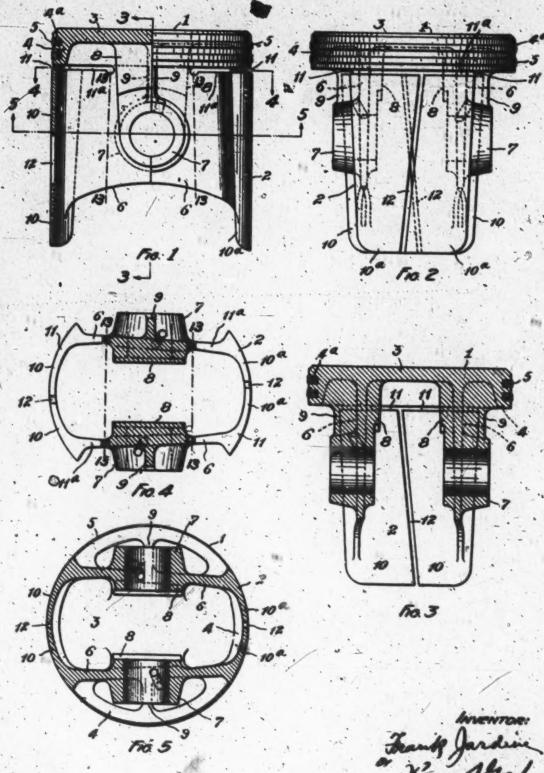
(Filed January 27, 1934.)

June 10, 1930.

F. JARDINE

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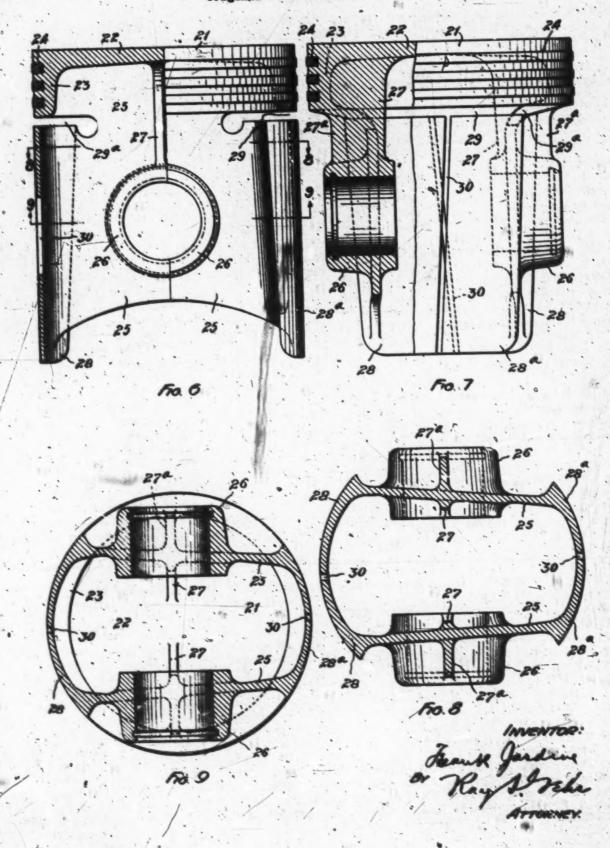
Original Filed March 11: 1920



June 10, 1930.

1,763,523

Original Filed March 11, 1920



UNITED STATES PATENT OFFICE

PRANE JARDINE, OF CLEVELAND, ONIO, AMERICO, BY MINES ASSIGNMENTS, TO REAL CLEVELAND TRUST COMPANY, AS TRUSTER, OF CLEVELAND, CHIC, A CORPORATION OF OFFICE

PURCOLL

Application filed Murch 11, 1990, Serial No. Society. Respect Murch S, 1991. Serial No. 450,500

My invention relates to pistons for internal combustion engines and especially to pistons formed of light weight metals or alloys. The invention has for its chief object the construction of a light alloy piston which, for with relatively small initial clearance, will the operate satisfactorily at all temperatures in an an engine cylinder.

Another object of the invention is to pro-

Another object of the invention is to pro 10 duce a piston of the character noted that will lend itself to economic methods of manufac-

Because of the high co-efficient of expansion of suitable light alloys such as aluminon of suitable light alloys such as aluminum alloys, as compared with iron, it is often difficult to fit an internal combination engine satisfactorily operable with iron pietons, with light alloy platons so that such pistons will not be noisy and will not pump oil when cold, or will not stick or score the cylinder wall when heated. I have found that these difficulties can be overcome by constructing a piston with its skirt or guide portion supported and slotted or divided in a manner to permit deformation and deflection of parts thereof without interfering with the performance of the assential functions of the respective parts.

To facilitate an understanding of the invention two forms or embodiments thereof are described hereinafter and are illustrated

are described hereinafter and are illustrate

in the accompanying drawings in which
Fig. 1 is a view partly in side elevation
and partly in section of a pisten constructed
in accordance with my invention.

Fig. 2 is a side elevation of the same pin-

Fig. 9 is a side elevation of the same piston viewed at right angles to Fig. 1.

Fig. 5 is a section on the line 3—3 of Fig. 1.

Fig. 5 is a section on the line 5—5 of Fig. 1.

Fig. 5 is a section on the line 5—5 of Fig. 1.

Fig. 6 is a view partly in side elevation and partly in section of a paston of modified form.

Fig. 7 is a side elevation of the same viewed at right angles to Fig. 6 and with parts broken away and shown in section.

Fig. 8 is a section on line 5—5 of Fig. 6.

Fig. 9 is a section on line 5—5 of Fig. 6.

Referring first to Figs. 1 to 5, the piston shown comprises a head portion 1 and a guide or skirt portion designated in its entirety by

2. The head portion commists of a head disc 5 and a peripheral flange 4 is which are grooves 4 for the ordinary piston rings 5. On the lower face of the head disc 5 are

on the lower face of he head disc are formed two depending webs 6 integral with the disc. Then webs carry bosses? which are adapted to receive the ordinary wrise pin Ribs 3 may be provided along the webs 6 between the head disc and the bosses for strengthening the webs 6 and supporting the inner ends of the bosses. Additional ribs may be formed on the outer sides of webs as shown to strengthen them and to suppose the outer ends of the bosses.

The guids portion 3 comprises two pairs of guide segments 10 and 10 curved to conform to the engine cylinder, one pair being located on either side of the bosses. The segments are integral with the webs 6 and assupported and connected to the bead portion 1 by means of these webs. The segments at their upper ends are separated from the fallows of head portion 1 by means of these webs. The segments at their upper ends are separated from the fallows of head portion 1 by slots 11 and are further solated from the head by slots 11 formed in webs 5. The segments of outer are separated from one another by a longitudinally entunding slot 12 said she preferably being inclined or spirally arranged as shown. In the construction shows the guide portion formed by segments 10 in designed to take the diagonal thrust of the piston rod during the compression stroke of the outer guide portion 10 is made marrower directly and portion 10 is made marrower directly and portion 10 is made marrower directly and to say weight.

The fangs of the beed portion 1 has 10 says weight.

cumferentially than the other portion 10 so as to save vength.

The fange i of the head portion 1 has a smaller outer diameter than the guide portice 2, the diameter of the latter being only elightly smaller than the internal diameter of the cylinder in which it is to function.

In the operation of an internal combustion engine the piston usually is heated to a higher temperature than the cylinder wall and expands radially to a greater amount than the cylinder. This expansion reduces the clearance between the proton skirt or guide part and the cylinder wall and or pistons not constructed according to

on, if the initial clearance providis small, seering of the cylinder walls or ton, or seisure of the piston in the cylinder by result. With my invention, however, a guide segments 10, 10°, are capable of formation or displacement as the piston ide parts expand, the segments being reed toward one another so as to tend to close up the slots 12. The webs 6 and guide segments preferably are so designed that this displacement of the segments 10, 10°, is remitted by virtue of a bending of the wess 6 at points remote from the guide segments. To this end, as shown in Fig. 4, the thickness of 18 the guide segments is increased toward the webs 6 are decreased in thickness from the guide portions inward toward the bosses to points in line with the inner ends of the slots 11°. This gives in effect a cantilive structure weakest at its support, namely, along the dotted lines 13 in Figs. 1 and 4. Thus the reaction force of the cylinder wall se up the s ota 19. The webs 6 and guide se the reaction force of the cylinder wall the piston expands tends to cause bending of the webs 6 along said lines 18. Due to the bending of the web sections 6 and the forcing together of each pair of seconds. a the outer faces of the guide segments as together of each pair of segments, the guide part of the piston may undergo a considerable thermal expension without a corresponding increase in the outer diameter thereof and thus a small initial clearance can be used without danger of scoring or seizure of the

6 obviously will increase the force necessary to cause the guide segments 10, 10° to ap-proach one another along the slot 12.

In Figs. 6 to 9 a modified form of piston is shown. The head portion 21 is formed with a head disc 22 and a depending peripheral flange 25 in which may be formed grooves 24 for the ordinary piston rings. Depending webs 26 are formed at diametrically opposite parts of the lower edge of the peripheral nge 22. These webs carry bosses 26 for the domary wrist pin, the inner ends of the because being supported by ribe 27 which join the webs 26 and extend from the inner ends of the beass 26 to the lower side of the head

disc 22, while the outer ends of said bosses

on either side of the bosses 26 are formed pairs of guide segments 28 and 28 similar to those shown in Figs. 1 to 5. These seg-ments are united with webs 25 as shown and are separated from the flange 25 by slots 29 and further isolated from the head by slots 29 in the walls 25. The guide segments of sch pair are separated from one another by longitudinally extending slots 80.

It will be seen that this last form of construction is based upon the same principles as the first form and further detailed descrip tion is therefore unnecessary. The main difference between the last form of construction and that first described resides in the webs 35 which support the wrist pin bosses and the guide portions, said walls being joined to the head structure at the lower edge of the ring flange 28 rather than springing from the head disc as in the first form of construc-

From the foregoing description the operation of pistons embodying my improvements will readily be understood. It will be seen that an aluminum alloy pisten embodying my invention can be fitted to the engine cylinder with a very small clearance and th compensation for the relatively large thermal expansion of the guide section of the piston is provided by the displacement of the guide segments which results from the reaction piston.

By resistion of the thickness and the slots 11 of the webs 6 and the location of the slots 11 parts and effect such comparis and effect such comparison and effect such compa force of the cylinder wall on the outer faces

quate mechanical strength of the piston and small enough to obviate scoring of the piston and cylinder or seizure of the piston.

While I have shown my invention applied to the slipper type of piston as distinguished from the skirt type it is to be understood that the invention is essentially applicable to other forms of construction, the scope of the invention being indicated by the armount. the invention being indicated by the app ed claims

What I claim is

I. In a piston for as internal combustion engine, the combination of a head having ring grooves therein, a pinrality of webs integral with said head and having diametrically opposite pietos pia bosse therein, a skirt integral with mid webs relieved adjacent said webs and separated from the head by drawns are separated from the separat

cumferential slots and provided with a longitudinal slot connecting the lower end of the piston with one of the circumferential slots.

2. In a piston for an internal combustion engine the combination of a head comprising a head disc and a peripheral flange having ring grooves therein, a pair of chordal webs, substantially rectangular in shape and located opposité each other in the piston, connected integrally at their upper edges to the pe ripheral flange of the piston, diametrically opposite wrist pin bosses, one in each of said webs, a skirt for said piston integrally connected to each of the side edges of the webs and cut away so as to expose each of the rectangular webs and the piston pin bosses from the outside of the piston, said piston being provided with circumferential nlots between the skirt and head and with a longitudinal slot extending from one of the circum-

ferential slots to the open end of the piston.

8. An internal combustion engine piston comprising a head having a depending ring flange, webs integrally cast to the ring flange and depressed within the circumference deand depressed within the circumference de-fined by the ring flange, wrist pin bosses cast in the webs, and curved guide means integrally cast to the webs and provided with. 30 a longitudinal slit disposed between the ends of the webs on one side of the piston, the outer surface of the guide means being dis-posed in a circumference outwardly of the outer surface of the webs and merging into 33 the latter at included angles sufficiently great to permit the removal of a permanent mold part used to form the outer surface of the part used to form the outer surface of the

4. In a piston for an internal combustion engine, the combination of a head having engine, the combination of a head having a depending circumferential flange provided with ring grooves on the exterior thereof, chordal webs integral with the head and depending therefrom in opposite positions, pieton pin bosses, one located in each web opposite each other, a skirt pertion cut away from the head to expose the bosses in the webs and provided with curved bearing faces integral with the webs and connected to the ends of the webs opposite each other, each of said bearing faces being separated from the head except for the integral connection through the webs and one of said bearing faces having a substantially vertical alos therein.

5. In a piston for an internal consensus, the combination of a head depending circumferential fiance with ring groover on the exterior chordal webs integral with the head pending therefrom in opposite positi

from the head to expose the bosses in the webs provided with curved bearing faces in-tegral with the webs and connected to the ends of the webs opposite each other, each of said bearing faces being separated from the head except for the integral connection through the webs and one of said bearing faces having a substantially vertical slot therein.

6. In a piston for an internal combustion engine, the combination of a head having a depending circumferential flange provided with ring grooves on the exterior thereof, chordal webs integral with the head and depending therefrom in opposite positions, pis-ton pin bosses, one located in each web op-posite each other, ribs integral with and subposite each other, rips integral wabs joining stantially perpendicular to the wabs joining the wabs, the bosses and the head together, a skirt portion out away from the head to expose the bosses in the webs and provided with curved bearing faces integral with the webs and connected to the ends of the webs op-posite each other, each of said bearing faces ing separated from the head except for the segral connection through the webs and one of said bearing faces having a substantially vertical slot therein.

vertical slot therain.

7. A pinton for an internal combustion engine comprising a head portion having a depending ring flange, a skirt portion, said skirt portion comprising a pair of substantially parallel webs carried by the head portion and provided with opposed wrist pin bosses, hearing portions carried by the ends of said webs and separated from the head by air 100 gaps, the laterally outer faces of said web portions being free from interally overhanging edge portions of the bearing faces, one of said hearing faces being provided with a longitudinal slot disposed in semadiate the end 100 portions of said bearing face.

8. In a piston for an internal combustion engine, the combination of a head having a cylindrical ring flange, oppositally disposed webs integral with the flange and carrying 110 diametrically opposits picton pin bosses, a skirt, integral with the flange and entraied from the ring flange by circumferential slits and provided with a longitudinal slit distinguish and provided with a longitudinal slit distinguish and a peripheral flange having ring grooves the combination of a head comprising a dism and a peripheral flange having ring grooves the combination of a head comprising a dism and a peripheral flange having ring grooves therein, a pair of chordal webs contained as and a peripheral flange having ring grooves therein, a pair of chordal webs contained as and a peripheral flange having ring grooves the sing of the head to perivally connected to the flange of the head optimized with a series as a way to expect the webs and integrally connected to the flange of the head between the sing separated from the head between the sing separated from the head between the 7. A piston for an internal combustion

10. In a piston for an internal combustion engine, the combination of a piston head including a depending ring flange, oppositely disposed webs depending from the ring flange and disposed inwardly thereof, wrist pin bosses in the webs, and curved bearing means rally connected to the webs and separated from the head by air gaps extending circumferentially of the piston between the 10 ends of the webs, the said bearing means hav-ing a slit located between the ends of the webs and extending in a direction lengthwise of the piston.

11. In a piston of an internal combustion 1s engine, the combination of a piston head having a cylindrical ring flange depending therefrom, webs integral with the flange extending convergingly inwardly of the pis-ton from the opposite portions of the flange 20 and then lengthwise of the piston in substantially parallel arrangement, wrist pin bosses in the webs, and a skirt joined to the ends of the webs on opposite sides of the bosses and cut away to expose substantially as all of the sides of the webs, all the foregoing parts being integrally connected together there being circumferentially extending air gaps separating the head and skirt between e webs and a slot in one side of the skirt so between the ends of the webs and extending

in a direction lengthwise of the piston.

12. In a piston for an internal combustion engine, the combination of a piston head comprising a disc with a depending peripheral ring flange, a skirt separated from the head by circumferentially extending air gaps, chordal webs integrally connected at their ends to the skirt with their outer surfaces near the points of connection with the skirt diversing outwardly to merce into the o skirt diverging outwardly to merge into the outer surfaces of the skirt, wrist pin bosses integrally formed with the webs, and integral connections between the depending flange of the head and the adjacent ends of the webs, and integral connections extending from the flange inwardly and lengthwise of the piston and merging into the webs with outwardly diverging surfaces, the skirt having a longitudinally extending slit formed on one side thereof between the ends of the webs.

In testimony whereof, I hereunto after my

In testimony whereof, I hereunto affix my signature.

FRANK JARDINE.

PLAINTIPPS' EXHIBIT NO. 4.

Maynard Patent in Suit.
U. S. Patent No. 1,855,968, January 10, 1928,
To H. E. Maynard.

Piston.

(Filed January 27, 1934.)

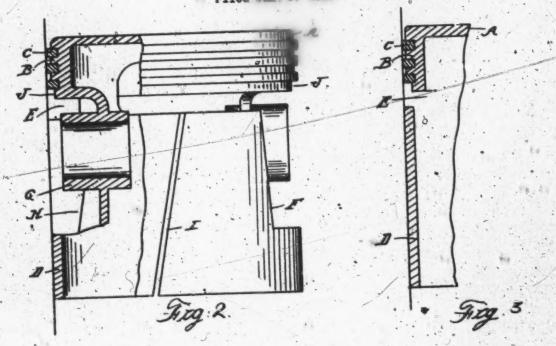
Jan. 10, 1928.

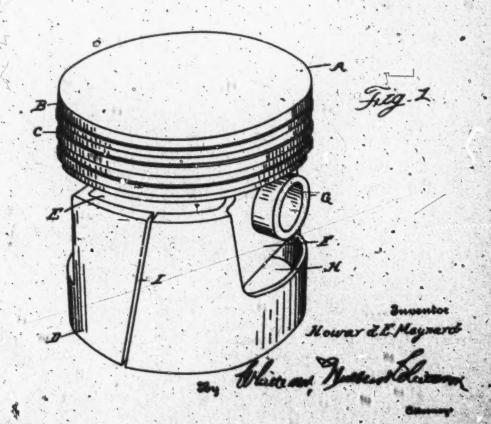
H. E. MAYNARD

1,655,968

PISTON

Filed Jan. 5, 1921





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UNITED STATES PATENT OFFICE

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MICHIGAN, A CORPORATION OF DELAWARE, AND ONE-MALE TO ADMINISTER CORP. PART OF ARCHIO, OF PROPERTIES, PRINCES AND A CORPORATION OF PROPE SYLVATIA

PERCH.

Application fied January & Attl. Berial No. 434,467

The invention relates to pistons designed for use in internal combustion engines and has for its object the prevention of "pumping" of oil and the "freezing" due to excensive expansion. In the present state of the art it is usual to construct pistons with a large obserance with reference to the diameter of the cylinder, and a skirt portion
more closely fitting the same and which
holds the piston in proper alignment and
prevents side alsoping. To avoid sticking or
freezing of this akirt, due to expansion, certain constructions of pistons have provided
the skirt with a longitudinal slot therein to
compensate for expansion, but there is any
serious difficulty with all such constructions,
vis, the tendency for the laborating oil to
work up beyond the skirt and rings and into
the explosion chamber. This results in the
formation of carbon and other difficulties
incident thereto. With the present invention I have overcome this difficulty by arranging between the cylindrical ring portion
and the skirt portion a continuous annular
groove. This will receive the all accepting
past the skirt and permitting the mean to
drop back in the cylinder without providing
any bridge for its passage to the ring portion. The result is that the cylinder will be
fully lubricated, while the excess of hibricant
will be samped off by the lowermout piston
rings into the annular groove, where it is permitted to drop back into the cylinder.

In the drawings:

Figure 1 is a perspective view of my improved construction;

Figure 2 is a francourse section thereof;
and cylindrical ring portion having a relatively large clearance with reference to the di-

Figure 2 in a transverse metion thereof,

Figure 3 is a similar view in plane at right

Figure 3 is a similar view in plant it right angles to Figure 9.

A is the pictor head beying a depending cylindrical partice B growed to excite the rings C and of a diameter to afford abundant clearance within the majors cylindre. D is a skirt, which is contently of a diameter to closely B the cylinder. This chies is find discontinuous with the plintings particle for particular to a grows B, which extends completely accoming a grows B, which extends completely accoming the major of the same. The connection industrial accomplishing accomplishing accomplishing a grows B, which extends completely accoming the same. The connection industrial accomplishing a grown by the same of the connection industrial accomplishing a second connection in the same.

parts is formed by webs F on diametrically opposite sides of the piston, said webs or tending inward from the portion B and our

particle formed by webs F on disanstrically opposite sides of the plette side of webs at sending ryward from the portion B and westerd downward and hiving formed in segral therewith the bearings G for the western the regard therewith the bearings G for the western their opposite vertical class but are no connected thereto either at top or bottom. Thus there are formed the recessor H surrounding the bearings G with assessed skirt portions on opposite ades thereof and an annular skirt portions. One of the sides of the skirt between the points of attachment of the webs thereof is longitudinally shitted as indicated at I and this all compensates for expansion and permits the skirt to conform stealf to the cylinder is agreed by the skirt portion of the pieces and will be found upward to the grows E at the upper end of the skirt. Parther eventures in prevented by I this groove and when the accumulation of all a relicious, it will drop back inside of the cili educant to the plates and for the cili educant to the plates are not of the cili educant to the plates attenued, the cylinder is accumulation of all is relicious, it will drop back inside of the cili educant to the plates attenued, the cylinderial portion B below the lowermost of the ring G is out away to provide a further drop and the ring G is out twen the prevente to the cylindrical portion B below the lowermost the cylindrical portion B below the lowermost of the cili education to the plates of the cylindrical portion B below the lowermost firm with several account the scale of the prevente of from the authors of the grindrical will see plate of from the authors of the grindrical will see the community of the cili the community of the lowermost ring will see an annually a cili see Alternation to the grindrical will see the community of the cili the community of the cilii to the community of the cili community of the cilii to the community of the cilii to the community of the ciliii to the community of the ciliii to the community of the ciliii to the community

Commercial Commercial

diametrically opposite sides of the piston, extending inward from said cylindrical portion and vertically downward, the opposite edges of said webs being connected to the said segmental portions of the skirt, and said skirt having an annular portion below said lower ends of said web.

2. A piston comprising a head having a depending cylindrical ring portion of relatively large clearance with respect to the diameter of the cylinder, and a skirt portion below said ring portion closely fitting said cylinder and separated from the ring por-istion by a continuous annular groove, webs-on diametrically opposite sides of said piston extending inward from said cylindrical por-tion and downward parallel to each other, the opposite vertical edges of said webs bese ing connected to the skirt, said skirt having an annular portion below said webs discon-nected from the lower ends of said webs and there being also provided a slit completely through the skirt from the lower to the upper end thereof, and wrist pin bearings carried by said walk

by said webs.

3. A piston comprising a head, a cylindrical skirt beneath said head having recesses in diametrically opposite sides thereof, parallel webs extending downwardly from said head and having the opposite side edges thereof connected to the side edges of the recesses in mid skirt, separating openings being pro-vided between the lower ends of mid webs as and said skirt and between the upper edges id skirt and said head, and wrist pin

of said skirt and said head, and wrist pin bearings carried by said webs.

A pisten otenprising a head having a depending cylindrical portion provided with annular grooves, rings engaging said greenes, the cylindrical portion below the lowermost ring being out away, a cylindrical skirt be seath the cylindrical portion of said head and having recesses in diametrically opposite side thereof, webs extending downwardly from said head and having the opposite side edges thereof connected to the side edges of the recesses in said skirt, separating openings being provided between the lower ends of said webs and each skirt, and wrist pin bearings carried by said webs, one side of said skirt between the points of attachment of said web thereto being slit longitudinally.

A piston comprising a head, a cylindrical skirt between the points of attachment of said web thereto being slit longitudinally.

A piston comprising a head, a cylindrical skirt between the points of attachment of said web should skirt separating recesses being problem and skirt separating recesses being problem.

ad wrist pin beam on couried by said

6. In a ploton for an internal combustion

engine, the combination of a head, a plurality of webs integral with mid head and having oppositely disposed wrist pin bosses mounted one in each web, a skirt integral with said webs relieved adjacent said webs to a probetween the bosses and the end of the stead piston being provided with circumfer be to a po eaid piston being provided with and skirt tial slots between the piston head and skirt and with a longitudinal slot connecting the open end of the skirt with one of the cir- respectively.

open sid of the mile of the cumferential stors.

7. In a pisten for an internal combustion—
engine, the con-bination of a bead and a plurality of webs integral with said head, dismetrically oppositely disposed wrist pin
bosses, one mounted in each of said webs and
integral therewith, a shirt integral with said
webs, relieved adjacent said webs, said rewebs relieved adjacent said webs, said lieved portion terminating between the bo and the and of the skirt, said piston b provided with circumferential slots bety the pinton hend and skirt, with a longitudinal slot connecting the end of the skirt with one of said circumferential slots, and with other circumferential slots between the end of the swirt.

8. In a piston for an internal combustion engine, the combination of a head provided with a disc portion and a flange portion, a swith ring grooves in the flange portion, a second

with ring grooves in the flange pair of substantially rectangular s integral with and depending from portion of the head, a pair of one integral with and depending from the it portion of the head, a pair of oppositely posed wrist pin houses mounted one in of said webs, a cross rib in said head an tegral with the disc portion and fings the head and with said web and pister love said webs and pister love said webs and integrally comments the side edges of each of said webs, piston being provided with airceamfores alots between the skirt and head, with a gitudinal slots with the bottom edge of skirt and with circumferential slots bottom edge of skirt and with circumferential slots bottom odge of skirt and with circumferential slots bottom odge of skirt and with circumferential slots bottom odge of the webs and the adje portion of the skirt.

A piston for an internal contact of the adjection of the skirt.

A A piston for an internal combustic gine, comprising a head, oppositely dis-walls depending from and connected at upper ends to the head, bosses carried and at their 118 upper each to the head, bears carried and walls out of direct centact with the and a skirt structure including two suitely disposed bearing portions joined within the critical indirectly entirected to the by the said walls, the skirt structure apparated by air gaps, from the head to upper edge, and from the said wall to upper edge, and from the said wall

for an internal comb

of the piston, bosses carried by the said walls out of direct contact with the head, and a skirt structure, including two oppositely disposed bearing portions joined together by actensions below each of the said bosses and indirectly connected to the head by the said separated, by air gaps, from the head at its upper edge, and from the said walls below she houses.

11. A piston for an internal combuntion engine comprising an integral head and HOWARD E. MAYNARD.

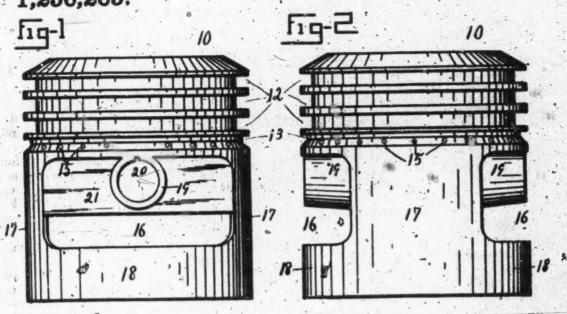
PLAINTIPPS' EXHIBIT NO. 5.
Schmiedeknecht Patent in Suit.
U. S. Patent No. 1,256,265, February 12, 1918,
To V. E. Schmiedeknecht.
Piston.
(Filed January 27, 1934.)

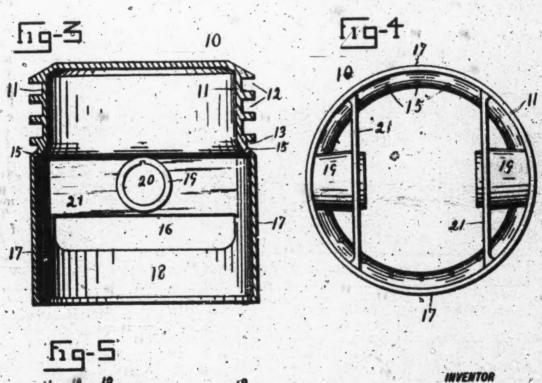
V. E. SCHMIEBEKNECHT.

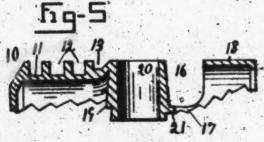
APPLICATION FILED JULY 14, 1917

1,256,265.

Patented Feb. 12, 1918.







Victor & Schmide knicht.

UNITED STATES PATENT OFFICE.

VICTOR R. SCHWIEDERWECHT, OF LOUISVILLE, RESTUCKY.

PIRTON.

1,256,265.

colfication of Letters Patent.

Patented Feb. 12, 1918.

Application fied July 16, 1917. Serial Wo. 190,511.

To all whom it may concern:

Be it known that I, VICTOR E. SCHALLEDS. KNECHT, a citizen of the United States, res ding at Louisville, in the county of Jefferson and State of Kentucky, have invented a new and useful Improvement in Pistons, of which the following is a specification.

This invention relates to pistons for in-

ternal combustion motors.

It has been ascertained to be essential that pistons of internal combustion motors should be as light as possible. In accordance with accepted construction pistons are hol low cylinders, closed at one end and open at the other, a connecting rod being secured interiorly thereof intermediate of their length by means of a transverse pin. Bosses projected inward from the side walls of the piston provide bearings for the pin. It was formerly thought that a shearing stress was exerted on this pin, and that the strain was transmitted to the side walls longitudinal thereof, and that the metal being under compression, the wall could be very thin, but failure of piston walls so constructed lead to the conclusion that the connecting sod exerted a bending stress on the pin by which a lateral strain was transmitted to the walls causing them to fracture around the bosses. This discovery necessitated an increase in the thickness of the walls and the use of braces or brackets extended from the bosses to the piston head, or to the wall, but thes expedients tend to increase the weight of the piston. To reduce piston weight, re-sort has been had to the use of metals (such as aluminum, or allows thereof) which have a lower specific gravity than cast iron, the metal commonly used; but the coefficient of expansion of aluminum is greater than that of iron, of which motor cylinders. of iron, of which motor cylinders are generally made. Consequently it is difficult to get a proper fit, for if the pisten is of such size as to fit in the cylinder property when at maximum temperature, gas and oll will leak by when a such size and oll will leak by when a such size and oll will leak by when a such size and oll will leak by when a such size and oll will leak by when a such size and oll will leak by when a such size and oll will leak by when a such size and oll will leak by when a such size a such size as a such size and oll will leak by when a such size a such size as a will leak by, when as at starting, the pi is cool.

An object of this invention is to provide pieton of minimum weight, with maximum

structural strungth

To the accomplishment of the fore and other objects, said invention consists the novel construction, conclution and the novel construction, conclution and tive accompanies of parts, making

features hereinafter fully described and 55 particularly pointed out in the claims appended bereunto.

In the drawing, wherein similar reference characters designate like parts in the several views, Figure 1, is a front elevation 60 of an embodiment of the invention: Fig. 2. a side elevation thereof: F.g. 8, a central transverse section on Fig. 1: Fig. 4, a bottom plan view: and Fig. 5, a fragmental sectional view.

Referring now in detail to the drawing, the reference character —10— designates, as an entirety, a piston, the side walls, —11— of which are provided with a plurality of grooves—12— adapted for the reception of 70 piston rings. An oil groove—13— is located just below the groups of piston ring grooves, and from the floor of this groove, a plurality of perforations—15— lead a plurality of perforations —15— lead through the wall of the piston, and serve 75 as an avenue of escape for oil that may ac-cumulate beneath the lower ring during the down stroke of the piston. The floor of this groove, is suitably inclined to facilitate the groove, is suitably inclined to facilitate the operation of drilling the holes 15. The only 80 portions of the apron of the piston (i. e., that portion of the wall which depends below the pin) which hear efficiently against the walls of the cylinder are those, fore and aft, which lie in the plane of the movement so of the connecting rod about the pin. The side portions (those below the ends of the pin) serve to steady the piston against lateral motion. I remove portions of said eral motion. I remove portions of mid apron, leaving openings —10— each of so which extends circum/erentially approximately one third of the distance around the piston, and longitudinally from a point just below the oil groove to within a speced distance of the lower end of the piston, here as tance of the lower and of the pintening a hand —18— of unflerees width to a satisfactory bearing on the Alixedings —19— each of width has a satisfactory for the reconstant of pin are attached at their outer and

of a piston constructed in accordance with the foregoing description will be evident to

The walls may be considerable thinner s than with the usual construction, as they are not subjected to lateral strain, the bearings being supported on the inner end by a bridge supported by the side walls, which gives great rigidity to them, offering a maximum resistance to the bending strain exerted by the pin. The removal of portions of the apron also serves to reduce the weight.

It is to be understood that applicant re-serves the right to resort to such changes, 15 modifications, and variations, as may proj erly come within the scope of the appended

claims.

Having thus described my invention so that those skilled in the art may make and 20 use the same, .

I claim:

1. A piston comprising a head section and a depending apron having oppositely disposed openings therein, alined bearings the outer ends of which z a suspended from said 25 bead section within said openings, and bridges sustaining the inner ends of said

bearings.

2. A piston comprising a head section, and a depending cylindrical apron, said head section being provided with a plurality of grooves for the reception of rings, and an oil groove having perforations leading from its floor to the interior of the pistor said apron having an opening below said oil groove, a bearing the outer end of which is suspended from the head section at up-per edge of mid opening, and a transverse bar attached respectively to the inner end of said bearing and to the apron.

8. A piston, comprising a head, and a de-pending apron having an opening therein.

pending apton having an opening there a bearing the outer end of which is attach to the head at the upper edge of mid open-ing, and a transverse bar adapted to support

the inner end of said bearing.

VICTOR E. SCHMIEDEKNECHT.

PLAINTIPPS' EXHIBIT NO. 6.
U. S. Patent No. 1,402,309, Jan. 3, 1922,
To L. P. Mooers.
Piston for Internal Combustion Motors,
(Filed January 27, 1934.)

L. P. MODERS.

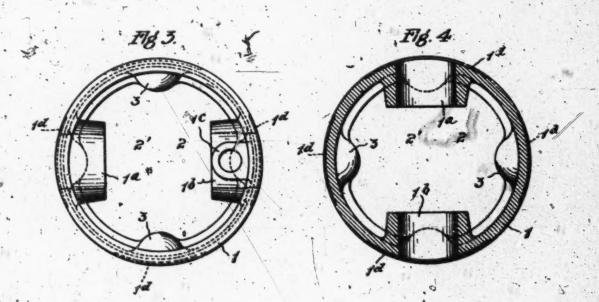
PISTON FOR INTERNAL COMBUSTION NOTORS.

1,402,309.

Patented Jan. 3, 1922.

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Louis O. Hurrers, by Haynest J. Sholey his atterney

L. P. MODERS.
PISTON FOR INTERNAL COMBUSTION MOTORS.
APPLICATION FILED JUNE 2, 1917.

Patented Jan. 3, 1922. 1,402,309. Fig. 5 Fig. 6 Fig. Z. Fig. 9. Fig. 8.

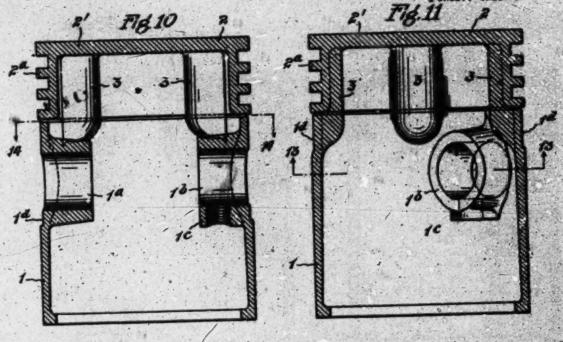
L. P. MODERS.

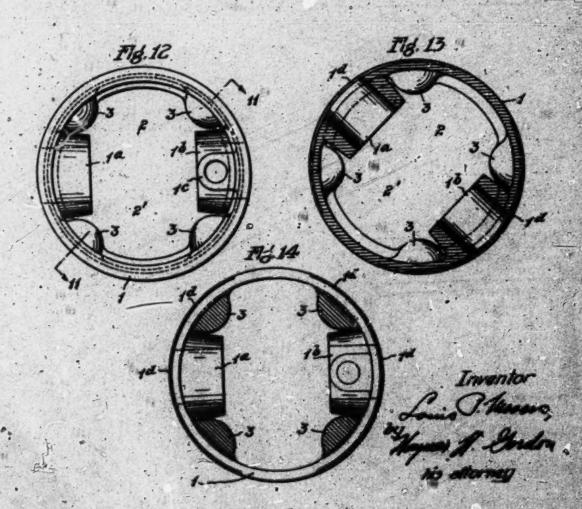
PISTON FOR INTERNAL COMBUSTION MOTORS.

APPLICATION FILED JUNE 2, 1917.

1,402,309.

Patented Jan. 3, 1922.





UNITED STATES PATENT OFFICE.

LOUIS P. MODELS OF CUSCULARY COR. AMERICA, ST SHART AND MINES ASSESSED.

M. DETT. DO THE CLEVELAND MAVE CONTAIN, OF CHAVELAND, CHILL & CORP.

BATION OF CHILD.

PERSON FOR DETERMAN AND DESCRIPTION POOR

1,402,300.

Control of Security Patented Jan. 3, 1020.

To all when it may exert.

Be it known that I how P Mrongities of the United States, resulting at Carcinant, in the placety of Hamilton and common of Ohio, and interpreted Contents are well as the Carcinant of the United States in any and the Carcinant in the placety of Hamilton and common of the Interpreted Contents in and Malatine to Placetic Transported Contents in and Malatine to Placetic Transported Contents in and Malatine to Placetic Transported Contents in the Interpreted Contents in the Interpretation of I

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The upper end of the guide section or skirt is separated from the head 2 by an air gap. In the drawings, purely for the purpose of illustration, this air gap is shown wider than is necessary. The presence of this air gap or air space between the upper edge of the skirt or body section 1 and the lower edge of the peripheral portion, ? of the piston head, insures that the heat ab-10 sorbed by the piston head principally will be transmitted inwardly and downwardly through the columns 8 so that such portion of it as does reach the skirt or body by conduction will do so at points below said air gap and will be reduced in amount so as to reduce relatively the expansion of the skirt as compared with the head, thereby permitting the skirt to be fitted relatively closely to the inner walls so of the cylinder. While this air gap, as above indicated has been shown, for the purpos of illustration, wider than necessary, it will be understood that my invention contemplates any sort of a separated relationship 28 between the upper end of the skirt and the adjacent head 2 because of which heat will not be transmitted efficiently or readily from the head to the skirt other than through a connector or connectors which join those so two parts of the piston together. It will be understood that this relationship might be that of a poor mechanical fit or joint which would be a poor condition of heat, as com-pared with the metal of the head 2 and con-35 nectors 3, so that such heat as did pass from the head 2 to the skirt 1 would do so principelly by way of the connectors 3, rather than from the head to the upper end of the

A piston of my improved construction may be made unusually light, durable and efficient by forming it of an integral casting of a metallic alloy having a relatively low specific gravity, such for example as an also of aluminum, copper and magnishim or any other metallic alloy of aluminum or other low specific gravity metal known by those skilled in the art to be suitable for the construction of cast, skirted pustons. As the alloys of metals of relatively low specific gravity, suitable for such purposes, here relatively high coefficients of expansion, some difficulty has been experienced with the use of pistons made of them in internal combination motors, due to the accessary clearance between the piston walls and the cylinder walls to allow for such expansion; as the result of which clearance, both "piston slapping" and "oil pumping" are "limit to slapping" and "oil pumping" are "limit to slapping" and "oil pumping" are likely to escape past the piston into the crank case and this down the lubelessat below to an undesirable degree.

It will be understood that with a please

constructed in accordance with my invention, the sleeve or skirt 1 may be constructed so as relatively snugly to fit the inner walls of the motor cylinder, whereas the head 2 may be given a considerable amount of clearance between its outer surface and the inner wall of the cylinder to allow for all necessary expansion of the head due to the high temperatures to which it is directly subjected. The fit between the skirt and the inner 15 wall of the cylinder may be a sung sliding fit and the area of the skirt which co-acts with the inner wall of the cylinder be such as to insure against the inner wall of the cylinder. In fact objectionable piston slap, incident to the operation of numerous types of pistons, for me in internal combustion motors, substantially is eliminated, by the use of a piston constructed in accordance with my invention. Likewise oil pumping is substantially instead and the passage of liquid hydrocarbons from the top of the piston to the crank case is practically eliminated, resulting in seminimizing of undue and troublesome carbonization and padesirable smoking among other things.

other things.

Due to the fact that the skirt or sleave I is maintained relatively cool under all nor—as mal conditions, the possibilities of scoring of the inner walls of the cylinder are practically eliminated.

The construction of a pisten embodying my improvements, as hereinbefore distribed, 100 may be readily carried out in partiament molds, which is not true of the construction illustrated in said Letters Patent No. 1,092,870, and I have had in mind the use of such permanent molds in the design of 105 my mid improvements.

of such permanent moids in the design of 102 my said improvements.

The exterior walls of the skirt hear the upper end thereof, where the connectors 5 join the skirt, may be relieved or recomed, as indicated at 1° to allow for greater expansion at these points than will occur at other points in the same circumference of the skirt,

It the modification of my investical filteraries in Figs. 1007 inclusive, the modification of my investical filteraries in Figs. 1007 inclusive, the modern control in Figs. 1007 inclusive, the modern control in the moder

ment with the ways like thus discount the account mitted through ment content pin bosses will be content that of a paried by the like the like the content of and content will be content with the content will be content with the content will be content with the content will be content to the content to

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eruliball of the head section across said air gap to the upper part of the guide section in the regions of said wrist pin bosses, the wall of said guide section being exteriorly

pap to the upper paid wrist pin in the regions of said wrist pin wall of said guide section being exteriorly relieved opposite said connectors.

A piston comprising a head section having end and peripheral walls, a guide section provided with diametrically opposite wrist pin bosses, and means connecting the wrist pin bosses, and means connecting the lower said bosses, the upper edge of the guide across in the regions of said bosses, the upper edge of the head being the lower edge of the head being tween said connecting means, and the guide 15 section being exteriorly relieved in the re-gions of the bosses and connecting means.

gions of the bosses and connecting means.

4. An integrally cast piston comprising a head section having end and peripheral walls, a guide section provided with diametrically opposite wrist pin bosses, and means connecting the head and guide sections in the regions of said bosses, the upper edge of the guide section and the lower edge of the head being separated by an air gap in the regions between said connecting means and 25 regions between said connecting means an the guide section being exteriorly relieved in the regions of the bosses and connecting means.

5. A piston for an internal combustion 30 engine comprising a guide section having a pair of diametrically opposed wrist pin bosses integrally formed therewith, a head having end and peripheral walls the lower edge of the latter being spaced from the upper edge of said guide section by a practically continuous non-conducting air gapand connectors which extend from said peripheral to said smide section. ripheral wall downwardly to said gu tion and are integrally formed with mile peripheral wall and guide section, mid guide section being exteriorly relieved in

the regions of said connecting means.

6. An integral cast piston for an interral cast piston for an integral cast combustion engine comprising a guide a tion having a pair of diametrically oppo-wrist pin bosses, a head section having tion having a pair of diametrically opposition having a pair of diametrically opposition having and and peripheral walls, the lower edge of the latter being separated from the upper edge of said guide section by a relatively harrow air gap extending practically around the piston, and connectors which spring from aid peripheral wall of said head and the upper end of said guide section and bridge said air gap, there being so corest-out space between any of said connectors and the superestrictive walls—of the head and guide sections and said guide section being exteriorly relieved in the regions of said contents.

T. An integral cost piston for an integral imposition engine remprising a guide me on having a pair of diametrically opposed trist pin bours, a hand action having out ad peripheral walls, the lower edge of the so latter bring reparated from the upper o

of said guide section by a relatively narrows air gap extending practically around the piston, and connectors which spring from said peripheral wall at said head and the upper and of said guide section in the regions of said wrist pin bosses and heidge said air gap, said guide section being exteriorly relieved over continuous areas care embracing the region of one of said bases and the adjacent connecting means.

8 A piston for an internal combustion motor comprising a guide section having a pair of diametrically opposed wrist pin bosses integrally formed with the guide section, a head having end and puripheral walls, the lower edge of the latter being separated from the upper edge of the guide section in the lower edge of the latter being separated from the upper edge of the guide section in the section is an all guide section in the providing the sole section and combustion let were said beed and guide section.

9 A piston for an internal combustion asotor, comprising a guide section having a sole, comprising a guide section having a sole.

and providing the section.

It is possible to an internal combustion notor, comprising a guide section having a pair of diametrically opposed wrist planesses integrally formed with the guide section, a head having end and peripheral walls, the lower edge of the inter heing separated from the appear edge of the guide section by an air gap, and connectors between the peripheral wall of said head and the guide section formed integral therewith and radially inner with respect to said neripheral wall and providing the solutions. peripheral wall and providing to means of connection between said be

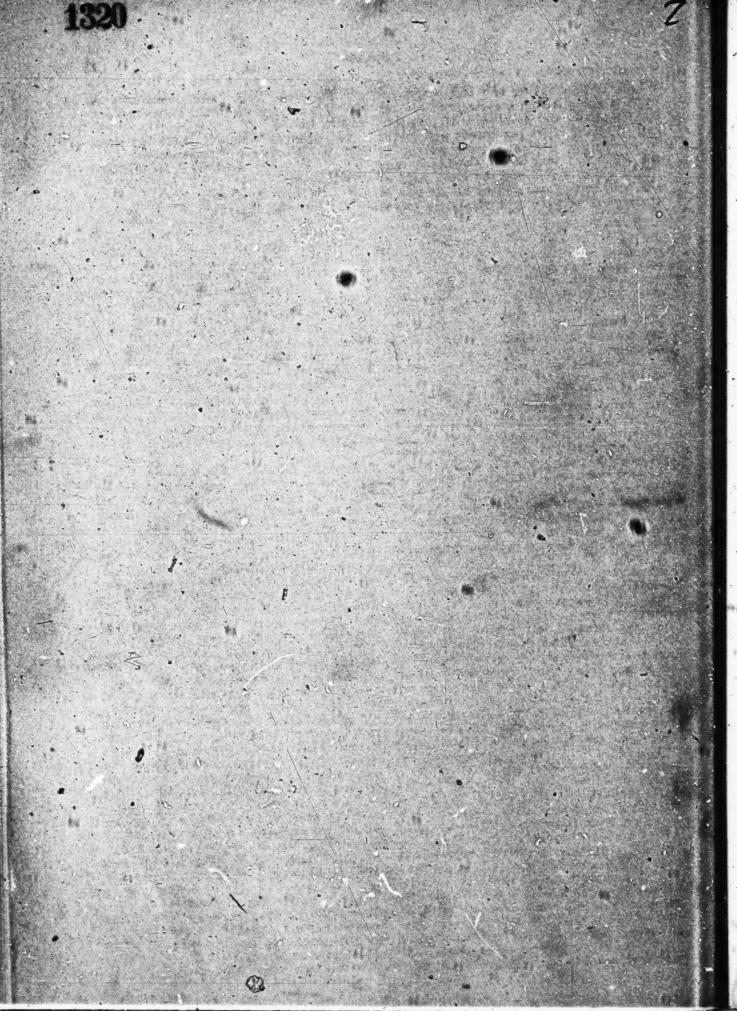
guide section.

10. An integrally east picture comprising a head section having and and peripheral walls, a guide section separated at its appareign from the lower edge of the peripheral wall of said head section by an air gap and provided with diametrically appears with his house and section connectors between the regions of said wrist pin bosses, and connectors being disputed radially inside the air gap and there being no considerations that prince between any of said connectors and the paids connectors and the said connectors are said connectors.

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The same of the sa

LOUIS P. MOOERS



PLAINTIFFS' EXHIBITS.

STIPULATED DIGEST OF ASSIGNMENTS OF PATENTS IN SUIT.

GULICK PATENT NO. 1,815,783 (PLAINTIFFS' EXHIBIT 2)

Plaintiffs' Exhibit 2-A

From Edward J. Gulick to Packard Motor Car Company

Interest: Entire

Consideration: Five Dollars Dated: November 23, 1917

Plaintiffs' Exhibit 2-B

From Packard Motor Car Company to The Cleveland Trust Company

Interest: Entire

Consideration: "Good and valuable"

Dated: September 11, 1922

JARDINE PATENT NO. 1,763,523 (PLAINTIFFS' EXHIBIT 8)

Plaintiffs' Exhibit 3-A

From Frank Jardine to The Aluminum Castings Co.

Interest: Entire

Consideration: One Dollar and Other

Date: March 9, 1920

Plaintiffs' Exhibit 3-B

From The Aluminum Castings Company to Aluminum Manufactures, Incorporated

Interest: Entire in Jardine application S. N. 364,997

Consideration: One Dollar and Other

Date: August 1, 1921

Plaintiffs' Exhibit 3-C

From Aluminum Manufactures, Inc. to Aluminum Company of America

Interest: Entire in Jardine application S. N. 364,997.

Consideration: One Dollar and Other

Date: July 1, 1924

Plaintiffs' Exhibit 3-D

From Alumirum Company of America to The Cleveland Trust Company, as Trustee

Interest: All assignor owns in Jardine application S.N. 450,898 filed March 9, 1921 (renewal of S.N. 364,997)

Consideration: Pursuant to agreement of April 26, 1924

Date: May 13, 1930

MAYNARD PATENT NO. 1,655,968 (PLAINTIFFS' EXHIBIT 4)

Plaintiffs' Exhibit 4-A

From Howard E. Maynard to Chrysler Corporation

Interest: Entire

Consideration: One Dollar Date: December 18, 1926

Plaintiffs' Exhibit 4-B

From Chrysler Corporation to Aluminum Manufactures, Inc.

Interest: One-half of the entire

Consideration: One Dollar and Other

Date: December 27, 1926

Plaintiffs' Exhibit 4-0

From Aluminum Manufactures, Incorporated to Aluminum Company of America

Interest: One-half of the entire Consideration: One Dollar and Other

Date: February 17, 1927

Plaintiffs' Exhibit 4-D

From Aluminum Company of America to The Cleveland Trust Company

Interest: All that Aluminum Company of America Owns.

Consideration: Pursuant license agreement and further considerations.

Date: February 23, 1928

SCHMIEDEKNECHT PATENT NO. 1,256,265 (PLAINTIFFS' EXHIBIT 5)

Plaintiffs' Exhibit 5-A

From Victor E. Schmiedeknecht to Frank J. Kent

Interest: Entire

Consideration: Ten Dollars and Other

Date: August 10, 1927

Plaintiffs' Exhibit 5-B

Warranty and Guaranty by Victor E. Schmiede-knecht

Date: August 13, 1927

Plaintiffs' Exhibit 5-0

From Frank J. Kent to Bohn Aluminum and Brass Corp.

Interest: Entire

Consideration: One Dollar and Other

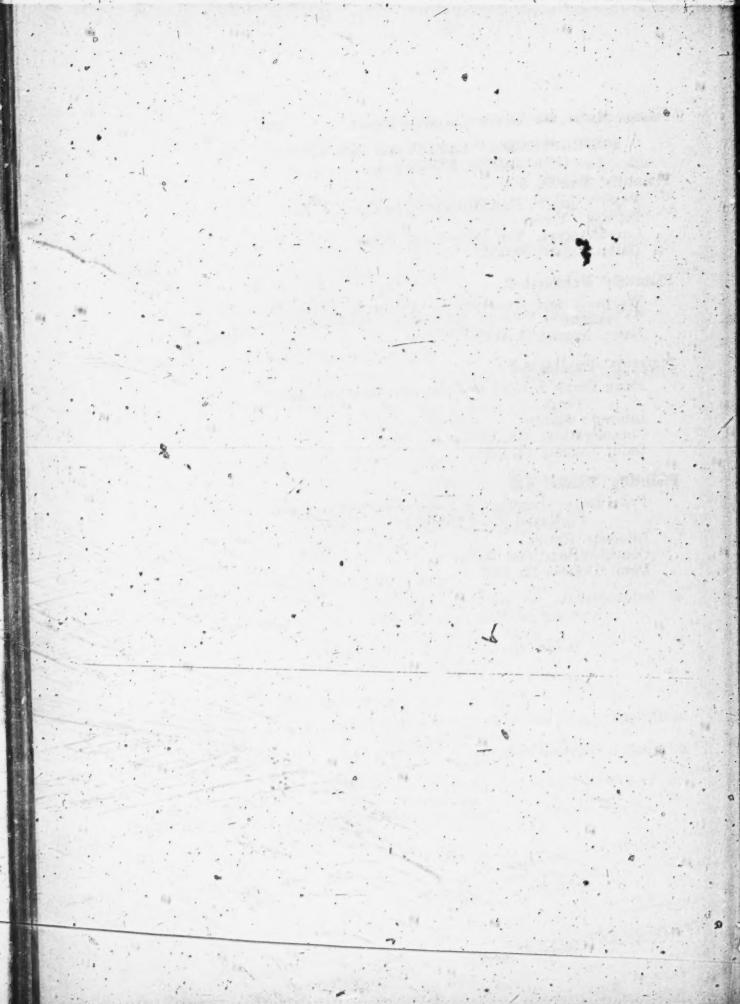
Date: October 12, 1927

Plaintiffs' Exhibit 5-D

From Bohn Aluminum & Brass Corporation to The Cleveland Trust Company

Interest: Entire

Consideration: One Dollar Date: October 31, 1927



FILED

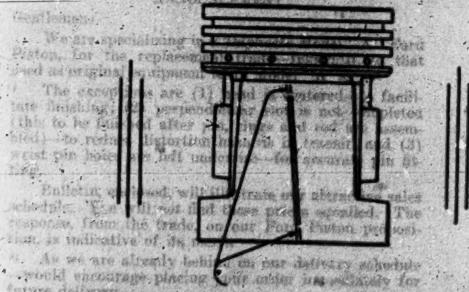
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Sterling Products Corporation Saint Louis, U. S. A.

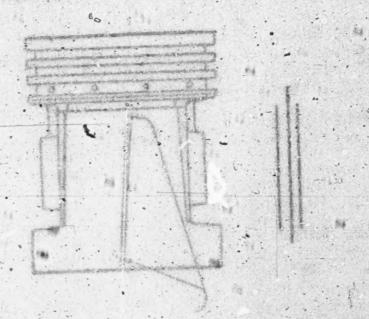
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and engineer of the common of

Plaintiff Exhibit C.

MOUNDAD



Complete (say thru at arrows) after wrist pin, rings, and rod are assembled—such before installing.

This slot is left unfinished so as to recisee distortion baxards in transit.

Sterling Products Companions
Sain Louis, U. S. A.

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PLAINTING MEASURE NEEDS NO. 7.

LA LES SERVICES OF PROPERTY OF SECURITY AND SECURITY OF SECURITY AND SECURITY OF S

PLAINTIFFS' EXHIBIT NO. 11. Circular Letter of Sterling Products Corporation.

(Filed January 27, 1934.)

STERLING PRODUCTS CORPORATION 2916 NORTH MARKET ST.

SAINT LOUIS

ANNOUNCEMENT

Gentlemen:

We are specializing in a Duplicate Model "A" Ford Piston, for the replacement trade—IDENTICAL to that used as original equipment to all Model "A"s.

The exceptions are (1) head is centered—to facilitate finishing; (2) perpendicular slot is not completed (this to be finished after pin, rings and rod are assembled)—to reduce distortion hazards in transit; and (3) wrist pin holes are left undersize—for accurate pin fitting.

Bulletin, enclosed, will illustrate our attractive sales schedule. You will not find these prices equalled. The response, from the trade, on our Ford Piston proposition, is indicative of its merit.

As we are already behind on our delivery schedule—would encourage placing your order immediately for future delivery.

Yours very truly,

STERLING PRODUCTS CORPORATION.

(Received Jun 13 1930 Evans & McCoy.)

PLANTIFFS' EXHIBIT NO. 13. Tabulation as to Sales Produced by Whitney.

(Filed January 27, 1934.)

SUMMARY OF ROYALTIES PAID BY LICENSEES UNDER THE PISTON PATENT ESTATE

V	1924	\$ 23,353.08
rear	1925	57,753.92
		51 284 82
	1926	58 940 99
	1927	200 810 43
*	7000	- MUUDOLVIAV
	1929	207,801.12
	1929 1930	141,982.96
	1001	20.212.01
	1931 (three quarters)	60,470.80
	1902 (three quarters)	
	a Note that the second	\$903,977.09

SUMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1925 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

LICENSEE	TOTAL PRODUCTION		NET		PAID -
Aluminum Co. of America	831,682		815,374 25,251		_ 13 13 1
	25,349 1,158,464		1,108,331		
	59,443		58,775	1	
	1,199,988	10	1,176,367		
	24,313		23,670		
	900,380 32,489	4,232,108	874,545 32,164	4,114,474	. 41,144.77
				LC STORY	
Kant-Skore Piston Co.	79,540		65,929	1	7.00
Kant-baore I aton co.	121,361		117,991	: .	
	170,393	537,102	159,541 163,619	497,080	4,970.80
	165,808	537,102	4 105,010	451,000	
					4
W. M. Levett Co., W. M	251,929		248,107.		
Levett Corporation and .	354,769		339,646		
W. M. Levett	314,454	1,209,496	303,176 272,906	1,163,835	11,638.35
0	288,344	1,209,490		2,200,000	_
	141		. 1		
National Piston Company	0		0		
Marional & Stone Company	0		0.		
	0		. 0		1.
	0				
	1 1	5,978,706	p.c. 5	5,775,392	57,753.93
			4		1

SUMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1926 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

LICENSEE	TOTAL PRODUCTION		NET SALES		BOYALTIES PAID
Aluminum Co. of America	1,361,988 21,844		1,351,133		
	913,469 63,306 777,690		900,879 62,813 772,643		
	1,709 553,930		1,675 550,216		13
	3,312	3,697,248	3,299	3,664,373	36,643.73
The Kant-Skore Piston Co.	353,178 355,372 164,778	111	344,218 341,827		
	129,953	1,003,281	161,849	967,504	9,675.04
Valker M. Levett Co., W. M. evett Corporation and	205,761 51,684		202,685 49,964		
V. M. Levett	29,233 96,129	382,797	25,601 93,813	372,063	3,720.63
he National Piston Company, nc.	41,622		10,379 41,622		
	48,289 ₃ 36,658	136,948	46,445 26,096	- 124,542	1,945.49
		5,220,274	18	5,128,482	51,284.82

SUMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1927 AS EXPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

LICENSEE	TOTAL PRODUCTION		NET SALES 947,692	NI SHE	PAID PAID
The Aluminum Co. of America	308° 1,133,980 1,681 974,468 750 792,434	3,856,866	303° 1,112,035 1,681 953,190 747 770,474	3,785,516	37,855.16°
The Kant-Skore Piston Company	186,683 . 144,695 68,474 69,168	469,020	179,060 141,836 66,397 64,484	451,806	4,518.06
Walker M. Levett Co., W. M. Levett Corporation and W. M. Levett	108,066 98,217 59,097	265,380	103,903 95,656 54,852 0	254,410	2,544.10
The National Piston Compar Inc.	y, 8,326 0 0	8,326	5,435 80° 0	5,355	63.65
Bohn Aluminum and Brass Corporation	172,268 1,188,278	1,380,546 5,960,138	169,152 1,157,790	1,326,942	13,260.42

^{*} Figures in red.

SUMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1928 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

	TOTON TATAL		3013
LICENSEE	TOTAL PRODUCTION	NET BALES	PAID
Aluminum Co. of America	2,243,764 1,500	2,218,170 1,500	
. 7	2,711,058	2,661,563 2,170	1
8	2,431,813 1,654,463	3,400,107 1,629,699	
	9,044,768	8,922,209	89,222.09
The Kant-Shore Piston Company	217,279 350,383 242,988 152,782	212,005 338,833 236,348 141,880	
	963,432	929,976	9,299.76
Bohn Aluminum and Brass Corporation	2,662,916 2,913,717 3,300,579 2,523,961	2,602,730 2,847,834 3,217,904 2,460,381	
	11,401,173	11,138,858	117,980.58
	21,400	,373 20,9	81,043

UMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1929 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

f			
Licenses	PRODUCTION	Nat Bales	BOYALTIES
uminum Company of nerica	2,325,994 2,488,086 1,849,879 985,713	2,317,894 2,473,737 1,832,064 958,082	
	7,649,678	7,581,127	75,811.27
uminum Industries, In	c. 384,196 664,521	373,429	•
	556,408 212,137 500,684	657 042 541,319 206,382 497,925	
	2,326,946	2,274,037	22,749.37
ha Aluminum and Bras rporation	3,576,703 3,663,794 2,678,192 1,062,812°	3,521,867 3,583,220 2,803,411 1,022,459	And the second s
Ma-	11,175,431	10,980,948	109,800,48
	21,152,049	20,786,112	207,861.12
THE PARTY OF THE RESERVE AND THE PARTY OF TH	NACTOR THE PLAN TO THE PROPERTY OF THE PARTY OF THE PART	AND THE RESIDENCE OF STREET WAS A STREET	E. I. TH. 159 (107 Mar. 4 St. 11 4 St.)

MMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1930 AS REPORTED BY LICENSERS UNDER THE

TIBION PAIRNI BOTATE					
Lacements	Total Production	Nat Balan	ROYALTERS PAID		
minum Co. of America	1,348,944 1,572,819 603,817 1,109,188	1,341,775 1,665,050 506,212 1,104,496	40,005.83		
NA.	4,634,068	4,609,533			
minum Industries, Inc.	085,196 986,784 642,541 469,174	668,014 970,490 632,684 458,423	TO THE STATE OF TH		
	2,783,008	2,722,620	27,236.10		
n Aleminum & Bress poration	2,764,300 8,475,617 1,004,161 644,565	9,731,960 9,444,600 1,000,460 600,600			
	6,978,582	6,805,865	63,601.63		
	14,396,318	14,190,000	141,900.00		

SUMMARY OF PISTONS MADE AND SOLD FOR THE YEAR 1931 AS REPORTED BY LICENSEES UNDER THE PISTON PATENT ESTATE

	PISTON PATEN	LESIAIE	
LICENSEE	TOTAL PRODUCTION	NET SALES	ROYALTIES PAID
Aluminum Company of America	973,900 1,024,002 262,177 255,167	970,735 3,020,669 257,898 249,413	
11.00	2,515,246	2,498,625	24,986.25
Aluminum Industries, In	e. 377,635 516,246 480,228 255,495	366,992 510,091 472,947 242,733	
	1,629,604	1,592,763	15,927.63
Bohn Aluminum & Brac Corp.	1,631,388 2,263,589 791,060 648,418	1,608,218 2,236,588 753,183 632,590	
	6,334,455	5,230,579	52,305.79
	9,479,305	9,321,967	93,219.67

SUMMARY OF PISTONS MADE AND SOLD FOR THE FIRST THREE QUARTERS OF THE YEAR 1932 PISTON PATENT ESTATE

		6,135,993		6,047,080	\$60,470.50
Bohn Aluminum & Prass Corporation	900,970 1,119,703 1,035,011	3,055,684	884,851 1,106,078 1,024,641	3,015,570	30,155.70
Aluminum Industries, Inc.	333,445 415,332 208,687	957,464	329,260 403,897 198,890	932,047	. 9,320.47
Aluminum Company of America	578,158 844,687 700,000	2,122,845	567,372 837,296 694,795	2,099,463	20,994.63
LICENSER	TOTAL PRODUCTION		NET BALES		PAID

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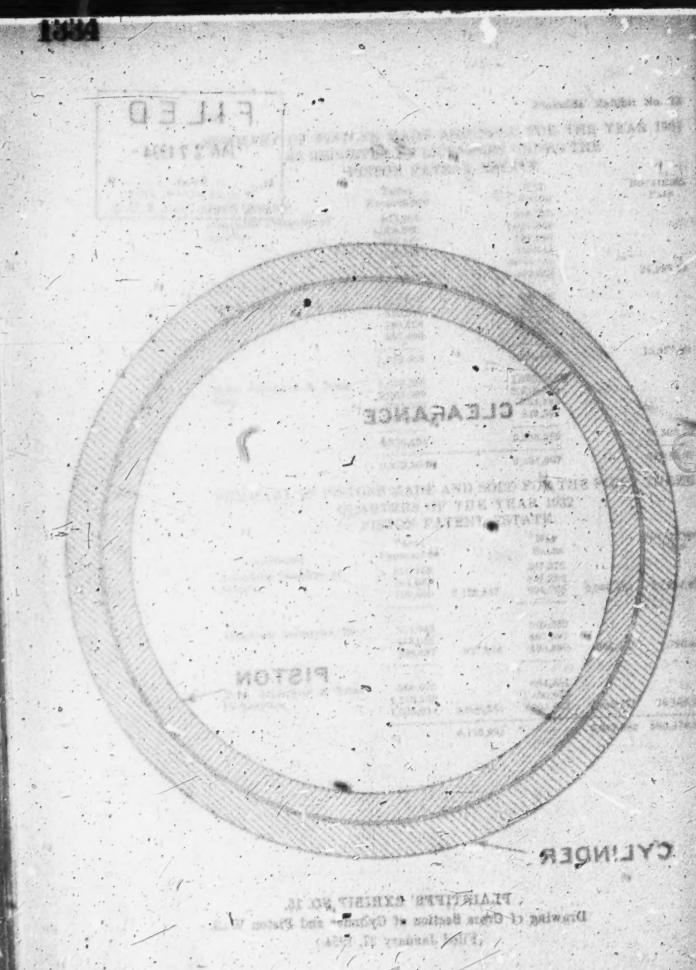
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STATEMENT OF COURSE STREET, ST. PROSTER OF

Drawing of Grow Books of Gylader and Pinton Wall. (Filed January 27, 1904)



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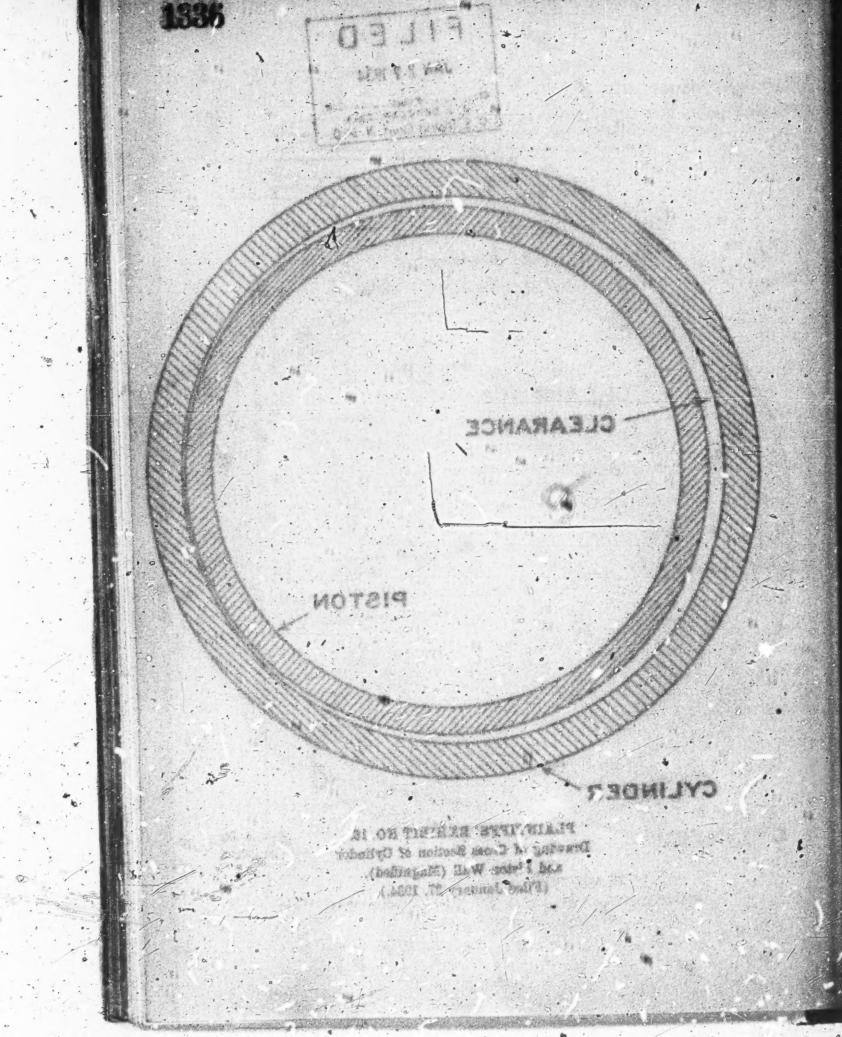
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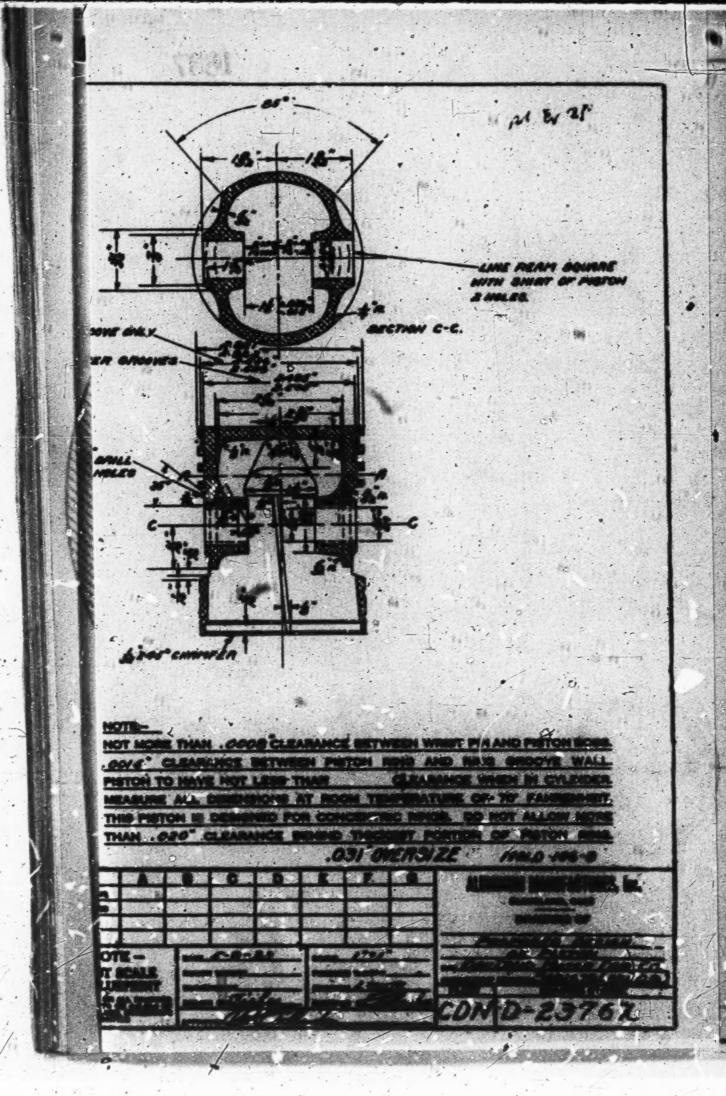
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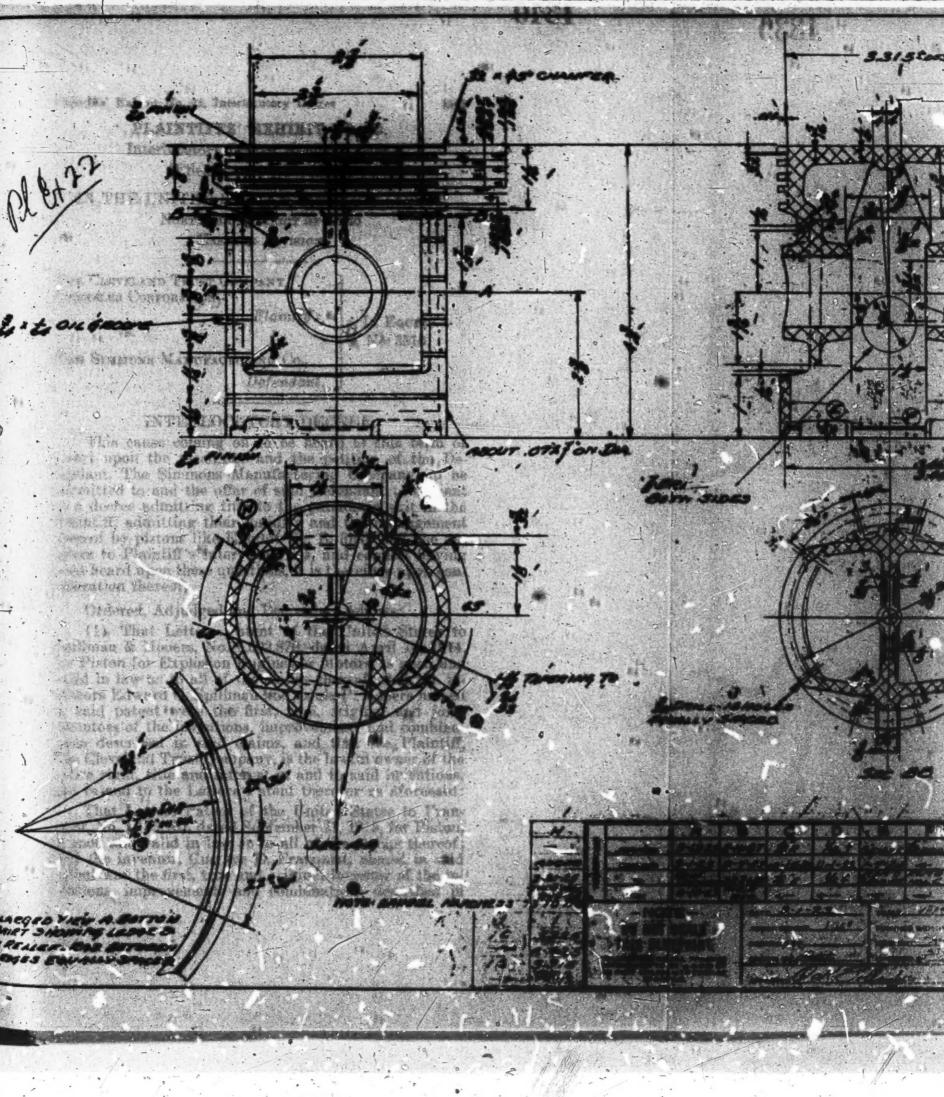
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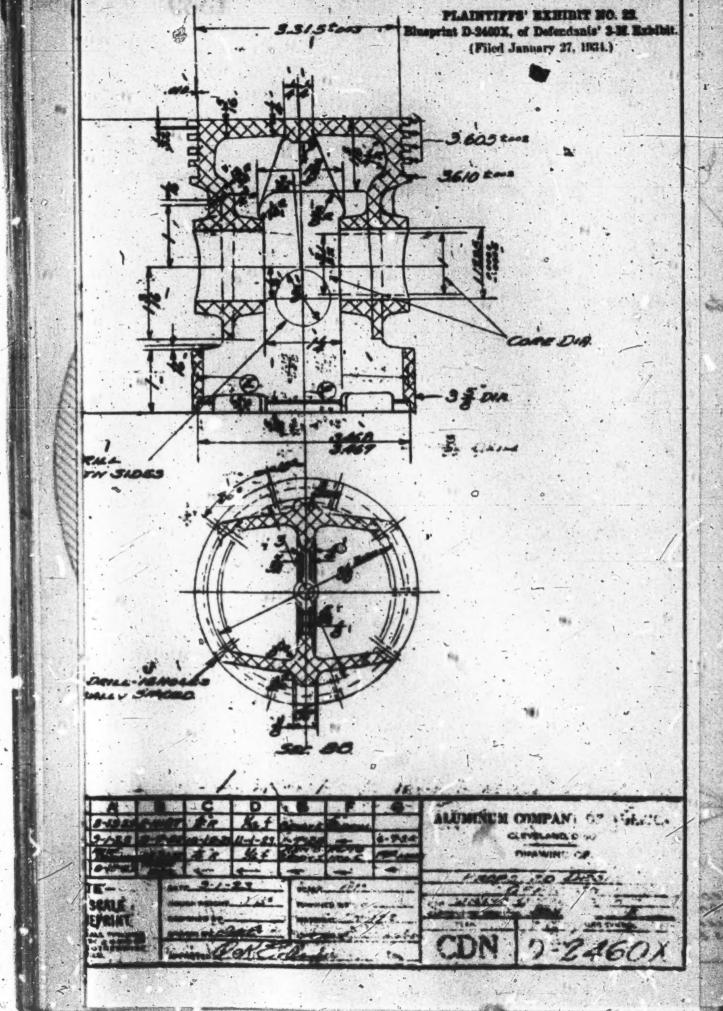




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PLAINTIFFS' EXHIBIT NO. 25. Interlocutory Decree, Simmons Case. (Filed January 27, 1934.)

IN THE UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF ORIO
EASTERN DIVISION

THE CLEVELAND TRUST COMPANY, CHRYSLER CORPORATION,

Plaintiffs,

VB.

IN EQUITY No. 3510.

THE SIMMONS MANUFACTURING Co.,

Defendant.

INTERLOCUTORY DECREE.

This came coming on to be heard at this term of Court upon the pleadings and the petition of the Defendant, The Simmons Manufacturing Company, to be permitted to and the offer of said Defendant to consent to a decree admitting title to the patents in suit in the Plaintiff, admitting their validity and the infringement thereof by pistons like Exhibit No. B, filed with the answers to Plaintiff's interrogatories, and counsel having been heard upon these questions, it is therefore upon consideration thereof,

Ordered, Adjudged and Decreed as follows:

(1) That Letters Patent of the United States to Spillman & Mooers, No. 1,092,870, dated April 14, 1914, for Piston for Explosion Engines or Motors, is good and valid in law as to all of the claims thereof; that the inventors Edward O. Spillman and Louis P. Mooers named in said patent were the first, true, original and joint inventors of the inventions, improvements and combinations described in said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid:

That Letters Patent of the United States to Franquist, No. 1,153,902, dated September 21, 1915, for Piston, is good and valid in law as to all of the claims thereof; that the inventor, Gustave E. Franquist, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in

said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the

Letters Patent therefor as aforesaid:

That Letters Patent of the United States to Schmiedeknecht, No. 1,256,265, dated February 12, 1918, for Piston, is good and valid in law as to all of the claims thereof; that the inventor, Victor E. Schmiedeknecht, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor a aforesaid;

and in and to the Letters Patent therefor a aforesaid;
That Letters Patent of the United States to Mooers,
No. 1,402,309, dated January 3, 1922, for Piston for Internal Combustion Motors, is good and valid in law as to
all of the claims thereof; that the inventor Louis P. Mooers, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiff,
The Cleveland Trust Company, is the lawful owner of the
entire right, title and interest in and to said inventions,
and in and to the Letters Patent therefor as aforesaid;

That Letters Patent of the United States to Howdeshell, No. Re-16,273, dated February 23, 1926, for Piston for Engine Cylinders, is good and valid in law as to all of the claims thereof; that the inventor, Roland M. Howdeshell, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid:

That Letters Patent of the United States to Maynard, No. 1,655,968, dated January 10, 1928, for Piston, is good and valid in law as to all of the claims thereof; that the inventor Howard E. Maynard, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiffs, The Cleveland Trust Company and Chrysler Corporation, are the lawful owners of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid;

That Letters Patent of the United States to Jardine, No. 1,763,523, dated June 10, 1930, for Piston is good and valid in law as to all of the claims thereof; that the inventor, Frank Jardine, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid;

That Letters Patent of the United States to Gulick, No. 1,815,733, dated July 21, 1931, for Piston, is good and valid in law as to all of the claims thereof; that the inventor, Edward J. Gulick, named in said patent was the first, true and original inventor of the inventions, improvements and combinations described in said claims, and that the Plaintiff, The Cleveland Trust Company, is the lawful owner of the entire right, title and interest in and to said inventions, and in and to the Letters Patent therefor as aforesaid.

(2) That the Defendant, The Simmons Manufacturing Company, has infringed upon said Letters Patent to Spillman & Mooers, No. 1,092,870, Franquist, No. 1,153,902, Schmiedeknecht, No. 1,256,265, Mooers, No. 1,40°,309, Howdeshell, No. Re: 16,273, Maynard, No. 1,655,968, Jardine, No. 1,763,523 and Gulick, No. 1,815,733, within the Northern District of Ohio, Eastern Division, and elsewhere in the United States, by the sale of pistons employing or embodying the inventions set forth in each of said patents, as illustrated by Exhibit B; and the Defendant, The Simmons Manufacturing Company, has contributed to the infringement of each of said patents within the Northern District of Ohio, Eastern Division, and elsewhere in the United States.

(3) That Plaintiff do recover from Defendant, The Simmons Manufacturing Company, all profits, gains and advantages which the Defendant has, or shall have, derived, received or made by reason of said infringement, and that Plaintiff do recover from said Defendant any and all damages which the Plaintiff has sustained, or shall sustain by reason of said infringement by said Defendant.

(4) That this cause be, and the same is hereby referred to William B. Woods, Eag. a Master, to ascertain the amount of such gains and profits and the amount of damages sustained by the said Plaintiff by reason of such infringement; that the Defendant file its account with said Master in accordance with the Rules of Equity of

the Supreme Court of the United States relevant thereto; that on such accounting the Plaintiff shall have the
right to cause an examination of the officers, servants,
agents and employees of said Defendant, orally or otherwise, and also to cause the production of the Defendant's
books, vouchers, accounts, bills of lading, shop orders
and all documents relating to the pistons sold by Defendant, and that said Defendant, through its representatives, attend for such purpose before the Master from
time to time as the said Master shall direct, and that all
testimony and exhibits offered and used in this cause
on behalf of either party may be referred to and used
in such accounting.

That Defendant was duly notified under Section 4900 of the Revised Statutes of the United States of its infringement of said patents prior to the sale of any of the alleged infringing pistons by the Defendant, and that the Defendant continued to infringe notwithstanding said

notice.

- (5) That an injunction be issued out of and under the seal of this Court, directed to the Defendant, The Simmons Manufacturing Company, its officers, servants, agents, employees, workmen and all their privies, and each and every one of them, enjoining and restraining them during the remainder of the respective terms of said Letters Patent, all but Spillman & Mooers, No. 1,092,870, from directly or indirectly constructing or causing to be constructed and/or using and/or selling or causing to be used or sold or advertising for sale, pistons employing or embodying any of the inventions set forth in any of said patents, or apparatus, article or device to be used, or capable only of use, in a combination infringing any of said patents, and from infringing and contributing to infringement upon or violating any of said Letters Patent in any way whatsoever.
- (6) That Plaintiff recover from the Defendant the Plaintiff's full cost in this suit to date and on any matter of accounting herein againt this Defendant to be taxed and to have execution therefor.

Entered this 25th day of September, 1931.

JONES,

United States District Judge.

We consent to the entry of the above decree.

E. L. HYDE,

Counsel for Defendant, The Simmons

PLAINTIFFS' EXHIBIT NO. 26.

Conveyance, Declaration of Trust and Agreement between L. P. Mooers and George B. Pitts and The Cleveland Trust Company Dated March 7, 1922.

(Filed January 27, 1934.)

THIS CONVEYANCE, DECLARATION OF TRUST AND AGREEMENT, entered into at Cleveland, Ohio, as of the 7th day of March, 1922, by and between L. P. Mooers and George B. Pitts, of Cleveland, Ohio, First Parties, and The Cleveland Trust Company, a corporation of Ohio, Second Party.

WITNESSETH, that

Whereas, the First Parties now own, control or hold the entire right, title and interest in to and under certain Letters Patent of the United States for inventions or improvements relating and pertaining to and for use in or in connection with pistons for explosion engines or motors, a list of which marked "Inventions" is hereto attached and made part hereof; and

Whereas, said First Parties are desirous of assigning, transferring and conveying the "Property" embracing said "Inventions" hereinafter more fully described, in trust, for the uses and purposes hereinafter set forth, and are desirous of appointing and constituting the Second Party Trustee hereunder, with the respective powers, duties and discretions hereinafter set forth:

Now, THEREFORE, in consideration of the premises and of the covenants and agreements of the parties hereto, respectively, said parties have agreed and do hereby agree as follows, that

- A. For the purposes of this agreement, wherever hereinafter used, the terms:
- (1) "Property" shall mean and include (a) Each and all of the Letters Patent; (b) each and all of the applications for Letters Patent; (c) each and all of the inventions and improvements; (d) each and all of the licenses, and (e) all property, rights, money and proceeds of any and every nature whatsoever, which may be acquired, held, controlled, collected or received by said Trustee in connection with this trust and subject to the terms and provisions hereinafter set forth.

- (2) "Grantors" shall mean and include the First Parties hereto.
- B. For the purposes and objects expressed herein, and in order that the entire control, management and disposition of the "Property" may be vested in trust for the use and benefit of such persons or corporations as may from time to time be the beneficiaries hereunder, the Grantors hereby constitue and appoint the Second Party Trustee hereunder, with all the powers, duties and discretions as hereinafter set forth with reference to the "Property" and the management, control and disposition thereof.
- C. Said First Parties, the Grantors, covenant and agree, that
- (1) For the joint and several considerations hereinafter set forth, they will and hereby do sell, assign, transfer and set over to said THE CLEVELAND TRUST COM-PANY, Trustee, and its successors in trust, the entire right, title and interest owned, held or controlled by them in, to and under each and all of the inventions or improvements embraced by said exhibit "Inventions" hereto attached, and in, to and under each and all of the Letters Patent of the United States and all other countries which have been or may be granted therefor, subject, however, to a license heretofore granted under certain of said Letters Patent to NORDYKE & MARMON COM-PANY, of Indianapolis, Indiana, as of the date of April 23, 1920, and which license is hereby assigned and conveyed to this Trustee; in trust, however, for the uses and purposes, and subject to the terms, provisions and conditions hereinafter stated.
- (2) At the time of the execution of this instrument, said First Parties own, control or hold the entire right, title and interest in, to and under each and all of said inventions or improvements enumerated and specified in said exhibit "Inventions" and the Letters Patent of the United States which have been granted therefor, subject to said license to Nondyke & Marmon Company, and that such interests and rights have not been encumbered; that they are free to transfer the same and that they have not entered into or executed and will not enter into or execute any assignment or agreement in conflict herewith.
 - (3) They and their heirs and legal representatives, without further compensation, will promptly execute and

deliver any further paper, assignments or instruments, and do all other acts which, in the opinion of counsel for said Trustee shall be necessary or convenient to secure to and vest in said Trustee the full and complete legal title to the "Property" aforesaid, or any of it.

- D. Subject to the conditions and provisions hereinafter set forth, the Trustee shall be and it hereby is authorized and empowered as follows:
- (1) To hold the title to the "Property," to determine upon and in its own name to institute and conduct suits, actions or proceedings at law or in equity relative to this trust, or in any way affecting the "Property," or any part of the same, including suits or proceedings to restrain or enjoin infringement of or to recover incomes or proceeds arising out of the "Property," and damages and profits of any and every nature whatsoever, including those arising from infringements of the Letters Patent, or any of them, embraced by this trust; to settle suits, actions or proceedings, at law or in equity, having to do with said "Property," or any of it, or with this trust, and to compromise or refer to arbitration any claims in favor of or against said trust; and likewise to defend actions or suits affecting said "Property" or this trust.

(2) To manage, develop and promote the "Property" and the interests of this trust, to endeavor to induce the use of said "Inventions or Improvements," and to endeavor to prevent the infringement of said "Letters Patent," of any of them.

- (3) To grant, execute and deliver licenses relating and pertaining to said "Property," or any of it, without covenants of warranty, however, on the part of the Trustee, and to change or modify the terms, provisions and conditions thereof from time to time as it may deem to be for the best interest of the trust.
- (4) To collect, receive and receipt for all license and royalty fees under said "Property," and all sums of money at any time coming due or belonging to said trust; and to hold, account for and disburse the same.
- (5) To acquire and receive the title to and licenses under inventions or improvements, applications for Letters Patent and Letters Patent which, upon their acquisition, shall be included within the term "Property" as used herein.
- (6) To execute and deliver such instruments as shall be necessary to convey or assign the "Property," or any

part thereof, without covenants of warranty, however, on the part of the Trustee.

- (7) To determine and fix the terms and considerations upon which sales or purchases of property may be made, and to determine and fix the terms and considerations upon which licenses may be granted and executed by the Trustee with respect to the "Property," or any of it, belonging to this trust.
- (8) To employ counsel, solicitors, agents and experts, when and for such purposes and periods of time as it may deem to be for the best interests of this trust.
- (9) To determine finally what shall be treated as capital, what as income, and what as costs or expenses of the trust, for any and all purposes connected with or affecting this trust.
- (10) To make advances or borrow money upon such terms and conditions, from time to time, for the improvement, protection or preservation of the property, or for the acquisition of additional property, whenever such may seem to it desirable or proper. For the repayment of such advances, with interest, the Trustee shall have a lien upon the trust property and for sums so borrowed may issue its promissory notes as Trustee, and secure the repayment thereof by mortgaging or pledging any part or all of the trust property.
- (11) To exercise such other powers incidental to carrying out this trust as it shall find necessary and proper, provided, however, that the same shall not be inconsistent with the nature of the trust herein and hereby created.
- E. (1) The Trustee hereby accepts said trust and agrees that, subject to and in accordance with the conditions and provisions hereinbefore and hereinafter contained, it will do all things which shall be necessary and proper, in its judgment, to protect and develop the "Property," for the benefit of the beneficiaries of this trust, who shall be trust beneficiaries only, without partnership, associate or any other relationship amongst themselves or between them and the Trustee; and that it will perform the specific duties herein required to be performed by it in accordance with the intentions herein expressed.
- (2) It shall be the policy of the Trustee in the conduct of the trust to endeavor to induce or require all who use the patented inventions or improvements belonging

to this trust to recognize the Letters Patent relating thereto.

- (3) The Trustee shall employ and keep competent representatives, for the purpose of dealing with all licenses embraced by this agreement, determining the amounts due thereon and collecting and receiving the royalties or income which shall be payable thereunder.
- (4) The Trustee shall use its best endeavors regularly to collect all royalties and incomes which shall become due and payable under the licenses granted by it in connection with the "Property"; and shall take proper steps and proceedings and use its best endeavors to collect all sums which shall belong to this trust. And said Trustee shall keep all moneys in its hands as such Trustee, separate and apart from the assets of its Banking Department, but allowing interest thereon at the rate and subject to such rules as may from time to time be in force and effect in its Savings Department.
- (5) The Trustee shall keep just and true books of account showing all collections and expenditures of any and every nature whatsoever made by it, and of the "Property" and rights of any and every nature whatsoever, received or acquired by it under the terms of this agreement, said books to be open at all reasonable times for inspection by the beneficiaries hereunder, or their duly authorized representatives; and shall furnish quarterly statements therefrom to the beneficiaries, and each of them hereunder. The fiscal accounting period hereunder shall be from January 1 to December 31, inclusive, of each year during the continuance of this trust.
- (6) Quarterly, on the fifteenth day of February, May, August and November of each year during the continuance of this trust, the Trustee shall distribute and pay over to the beneficiaries entitled hereunder pro rata, in accordance with their respective shares as registered on the books of the Trustee, the balance of all revenues, moneys, proceeds of sale or disposition, and license fees or royalties collected by it from said "Property," up to the first day of each said calendar month, respectively, after the deducting therefrom
 - (1) The reasonable expenses of management and development of the "Property," including all taxes and compensation to the Trustee, and the payment of loans and advances and interest thereon made by or to the Trustee in the interest of this trust;

- (2) Such sums of money as may be required in the acquisition of inventions and improvements, applications for Letters Patent, and Letters Patent, as hereinafter provided; and
- (2) Such fund or funds as may from time to time hereafter be set aside in reserve, as hereinafter provided.

Furthermore, out of the income of the trust, the Trustee may set aside an allowance for depreciation and/or depletion of the patents, patent rights and other properties embraced by the trust and which shall be subject to depreciation and/or depletion. The Trustee, in determining the amount of such an allowance, shall take into consideration the measure of the depreciation and/or depletion, if any, then allowable as a deduction from the income of the trust, in accordance with the income tax laws of the United States, but the Trustee shall not be bound to adopt such measure as the appropriate measure of the depreciation for which it shall set aside an allowance. The Trustee in its absolute discretion, may either accumulate the fund resulting from the aforesaid allowances for depreciation and/or depletion throughout the life of the trust, or may employ it in connection with the Reserve Fund hereinafter provided for, or may from time to time distribute to the beneficiaries any part or all of the funds so accumulated, thereby reducing to such an extent the "Property." Any such distribution of allowances shall be made to the holders of the certificates of interest in this trust as they shall then appear on the records of the Trustee, and shall be made in proportion to the respective number of shares in said beneficial interest so appearing to be held by them. any event, upon final distribution of this trust, as provided for in Article F (15) hereof, the entire amount of such accumulations then on hand and of said Reserve Fund, hereinafter provided for, then on hand, shall be distributed in the same manner as is provided for in the final distribution of other assets of the trust.

F. (1) The beneficial interest under this trust shall be represented by seven thousand (7,000) shares, evidenced by Trustee's Certificates of Interest, which said Certificates of Interest shall be in the form of the certificate hereto annexed and marked "Certificate of Interest," and shall be issued as follows:

Forthwith, after the execution of this agreement, the Trustee shall issue and deliver one (1) Certificate of Interest, in the form of the certificate hereto annexed and marked "Certificate of Interest," which shall be for three thousand (3,000) shares, and be issued and delivered to L. P. MOORRS.

The remaining four thousand (4,000) shares or any part thereof may be issued, during the continuance of this agreement, by the Trustee, at such prices or for such property or property rights and upon such terms, conditions and provisions, including series denominations therefor, as said Trustee may deem to be for the best in-

terests of the beneficiaries hereunder.

Such certificates and all like certificates issued by the Trustee hereunder, and the beneficial interest represented thereby, shall be transferable, in whole or in part, at all times, but subject to the terms and conditions of this agreement, and subject to such regulations as to transfer as the Trustee may prescribe, with the right in the transferee to receive from the Trustee a Certificate or Certificates of Interest, for the number of shares transferred to it or him; and the registered holder of any Certificate of Interest may be treated by the Trustee as the absolute owner thereof, and of all the rights of the original transferer (to the extent of the number of shares transferred), in the undivided interest in the "Property" represented thereby.

The Trustee shall have power to adopt appropriate rules and regulations in regard to the transfer of Certificates of Interest, and for registering such transfers, and from time to time to change such rules and regula-

tions as occasion may require.

- (2) No debt or liability shall be incurred by the Trustee, except such as may be incidental to the management and development of said "Property," and the Trustee shall have no power to bind the beneficiaries hereunder, or any of them, personally; and in every written contract which the Trustee shall authorize, enter into or make, reference shall be made to this Declaration of Trust; and each person or corporation, contracting or dealing with the Trustee, shall look to the funds and "Property" of the trust for payment under such contract or for the payment of any debt, judgment or decree, or of any money that may otherwise become due and payable; and neither the Trustee, nor any beneficiary hereunder, shall be personally liable therefor.
- (3) The Trustee may from time to time, as it shall deem expedient, select, retain, employ and discharge such representatives, agents and counsel and such experts as it may consider are best fitted to serve the trust. And the

Trustee may thereupon act, through and on the advice of the person or persons so selected, retained and employed.

- (4) The Trustee shall not be required to bring any suit or defend any suit with reference to the "Property" or to do any act or thing, under the terms of this instrument, which, in its judgment, may involve it in any liability unless and until indemnified to its satisfaction against any such liability and said Trustee shall be entitled to indemnity out of the "Property," as well as any funds held by it hereunder, including the Reserve Fund provided for in Article F (7) hereof, for any liability, loss, cost, damage or expense, which it may suffer or sustain in performing any of the terms and conditions of this agreement.
- (5) Should the Trustee at any time during the continuance of this trust determine that it is for the best interest of this trust to acquire and receive inventions or improvements, applications for Letters Patent, or Letters Patent, for the purpose of including the same under this trust, it shall proceed to acquire and receive such property upon such terms and considerations as it shall deem appropriate.
- (6) Should the Trustee determine that it is for the best interests of the trust to sell or otherwise dispose of the "Property" or any of it at any time, it shall designate, in writing, to the beneficiaries, the terms and considerations for the same, which in its opinion are adequate and for the best interests of the trust, and shall proceed to consummate such sale or disposition in conformity therewith, and the proceeds thereof shall become a part of the "Property" hereunder.
- (7) The Trustee, from the moneys in its hands, may set aside a Reserve Fund, sufficient, in its judgment, to defray from time to time the expense of developing, promoting and protecting the "Property" and the cost of any litigation and proceedings connected with or incidental thereto, and to indemnify the Trustee against personal liability or loss, growing out of any action taken by said Trustee hereunder, but such fund shall not at any time exceed the sum of Seven Thousand Dollars (\$7,000.00), unless contingencies arise which, in the opinion of the Trustee, justify the reservation of a larger sum in the best interests of the trust, whereupon, at its discretion, the Trustee may increase said Reserve Fund to Twenty-five Thousand Dollars (\$25,000.00), for such period of time as it may deem to be expedient. Such Fund shall, so far as practicable, be placed at interest,

as provided for in Article E (4) hereof, and all income derived therefrom shall become a part of the "Property."

The Trustee and any of its successors hereafter appointed may at any time resign the trust hereby created by giving not less than thirty (30) days' notice, in writing, to each of the beneficiaries hereunder by mail. to their addresses, respectively, as appear upon the records of the Trustee. In case of a vacancy caused by the resignation of the Trustee, or in case of the disability of the Trustee for any reason to perform the duties hereunder, a successor or successors to the Trustee shall be chosen as follows: Within ten (10) days from the date ofsuch resignation or notice of such determination of disability, the Trustee shall make application to a Judge of the United States District Court of the Northern District. of Ohio for the appointment by him of a successor Trustee or Trustees, and such Judge shall be and is hereby authorized and empowered to name and appoint a successor Trustee or Trustees to act hereunder; provided that should no Federal Judge for such District make the appointment, or there be no Federal Judge in the District, the Trustee shall make application to a Judge of the Common Pleas Court of Cuyahoga County, Ohio, who shall be and hereby is authorized and empowered to make such appointment.

Upon such appointment being made in either manner above prescribed, the successor Trustee or Trustees so appointed shall, upon written acceptance of the trust, become immediately vested with all the rights, power and trusts, and shall assume all the duties of THE CLEVELAND TRUST COMPANY as Trustee hereunder, with the same effect as if originally named as such Trustee; and said THE CLEVELAND TRUST COMPANY, or the party then occupying the position of Trustee, shall, upon demand of such successor Trustee or Trustees, or any one of them, account to such successor, and immediately execute all such assignments conveyances or other instruments as shall be necessary and proper fully to vest the successor Trustee or Trustees with all the right, title and interest in, to and under the "Property," including all sums of money which may then belong to said trust; and upon such accounting and conveyance and the delivery of such "Property," the Trustee, who has so resigned, or who has been removed, shall be from thenceforward relieved and dis-

charged from responsibility hereunder.

- (9) The Trustee may advise with counsel as to the interpretation of this instrument and as to any matter relating to the trust herein set forth, and shall be fully protected in any action or omission taken or suffered by it in good faith on the advice of such counsel, and it shall be protected in acting upon any notice, resolution, vote, request, consent, certificate, affidavit, voucher, bond or other paper or document, believed by it to be genuine and to be passed or signed by the proper party. Should the Trustee, in the performance of any of its duties herein and without affecting in any manner the irrevocable nature of this trust, deem it advisable to secure the assent or approval of the Certificate holders hereunder, it may do so by requiring their consent, in writing, to any course or plan of action, or any act or fact done or to be done, and the decision of a majority in interest of the Certificate holders shall be final and binding on all of them, and complete protection and authority to the Trustee. Nothing herein contained, however, shall be deemed to require the Trustee to secure or be bound by the assent or approval of the Certificate holders, or any of them, to any such course or plan of action, or to any act or fact done or to be done.
- (10) Should any suit or suits be brought against the Trustee by reason of or because of anything done by it under this agreement and in pursuance thereof, and not resulting from its own bad faith or willful misconduct, or that of its agents, servants or representatives, in connection with or growing out of the terms and provisions hereof, the Trustee is authorized to defend such suits, and for that purpose to employ funds of this trust sufficient therefor, and to fully indemnify it in connection therewith.
- (11) The Trustee shall not be liable hereunder for any loss prising out of the execution of this trust so long as it shall act in good faith; and said Trustee shall be liable hereunder only for the bad faith or willful misconduct of itself or its own agents, servants or representatives. In no event shall it be liable for any act or default of any counsel, solicitor, agent or expert, selected, retained or employed pursuant to the provisions of Article D (8), F (3) and F (9) hereof, provided reasonable care shall have been exercised by it in their selection. The Trustee shall not be required to give bond to secure the faithful performance of this trust by it, but in case of the appointment of a successor Trustee or Trustees, not a trust company, the said appointing Judge may, in

his discretion, require such security for the performance of the duties of such successor Trustee or Trustees as in his judgment is just and proper.

- (12) The Trustee shall receive reasonable compensation from time to time for all of its services performed under this agreement.
- (13) The death of a beneficiary holding a Certificate of Interest hereunder shall not operate to determine or in any manner affect this trust, but his Certificate of Interest shall pass to his executor, administrator, heirs, or legal representatives, and vest in them the ownership of such Certificate or Certificates of Interest, together with the interest in this trust represented thereby, in the same manner as it is held by the beneficiary.
- (14) Whenever the Trustee is required under this agreement to communicate with or give notice to the beneficiaries hereunder, it may do so by written communication or notice mailed contemporaneously to each of the beneficiaries entitled to receive the same, addressed to the last known addresses, respectively, of such beneficiaries, as shown by the records of the Trustee.
- of all the Letters Patent which may hereafter become a part of the "Property" of said trust, or until all of the "Property" has been sold or disposed of, as hereinbefore provided, and until the Trustee has fully accounted for, distributed and paid over all moneys and "Property" received, or in any manner held by it hereunder.
- (16) In the interpretation and construction of this instrument, the laws of the State of Ohio shall govern.

IN WITNESS WHEREOF, said L. P. MOORES and GROBGE B. PITTS have executed and delivered this instrument, and, as evidencing its acceptance of the trusts and confidences herein imposed upon it, said THE CHEVELAND TRUST COMPANY has caused this instrument to be executed and its corporate seal to be affixed hereto by executive officers, thereunto duly authorized, the execution and delivery being at Cleveland, Ohio.

L. P. MOORRS, GRONGE B. PITTS.

THE CLEVELAND TRUST COMPANY,

B. A. MALM,

Vice President.

A. J. PERFLER,
Assistant Trust Officer.

"INVENTIONS"

Patentee		Number		Date .	
Spillman & Mooers		1092,870		April 14, 1914	
H. C. Marmon		1293,846		Feb. 11, 1919	
L. P. Mooers	0	1347,819	. 2.	July 27, 1920	
L. P. Mooers		1402,308		Jan. 3, 1922	
L. P. Mooers		1402,309		Jan. 3, 1922	

and the undivided one-half of any right, title and interest now owned or held by said Louis P. Mooers in Letters Patent of countries foreign to the United States corresponding to said Letters Patent of the United States No. 1092,870.

This list forms a part of the Conveyance, Declaration of Trust and Agreement entered into as of the 7th day of March, 1922, between Louis P. Mooers and George B. Pitts and The Cleveland Trust Company.

CERTIFICATE OF INTEREST

THIS IS TO CERTIFY, that

Address is owner of shares of undivided interest in the net profits and avails, when the same may be distributable, from certain "Property" comprising certain Inventions or Improvements, Applications for Letters Patent which have been or may be filed therefor and Letters Patent which may be granted thereon, and rights thereunder, more particularly described in a certain Conveyance, Declaration of Trust and Agreement entered into as of the 7th day of March, 1922, by and between L. P. Mooers and George B. Pitts, therein referred to as "Grantors," and THE CLEVELAND TRUST COMPANY, therein referred to as "Trustee," a copy of which is on file at the principal office of said THE CLEVELAND TRUST COMPANY, in the City of Cleveland, Ohio, and open to the inspection of any holder of this Certificate, and that the legal title to said property is held by said THE CLEVELAND TRUST COMPANY for the use and benefit of the various registered owners of interests therein, subject to and in accordance with the provisions of the aforementioned Conveyance, Declaration of Trust and Agreement so on file, reference to which is hereby made for a description of the nature and extent of the

"Property," the rights and privileges of the holders of said Certificates of Interest, and the terms and conditions upon which said Certificates are issued. The holder of this certificate, by acceptance hereof expressly ratifies all of the terms and conditions of said Conveyance, Declaration of Trust and Agreement. The Cleveland Trust Company assumes no responsibility as to the validity of the title to the "Property" purported to be conveyed to it in trust, pursuant to the aforementioned Conveyance, Declaration of Trust and Agreement. The registered holder of this Certificate may be treated as the actual owner of this Certificate and the interest represented thereby for all purposes whatsoever.

This Certificate and the interest evidenced thereby, may be transferred upon surrender thereof to the Trustee, duly endorsed, and subject to such rules and regulations governing transfers as the Trustee may establish.

	THE CLEVE	LAND TRU		
		Vic	e-Presid	lent.
				1 .
Assistant Trust	Officer.			
Cleveland, Ohio,		, 19		

PLAINTIFFS' EXHIBIT NO. 28.

Bill of Sale, Amplex to Gulick.

(Filed January 27, 1934.)

AMPLEX MANUFACTURING CO.

MOTORS AND MOTOR CARS

Mishawaka, Ind., July 16, 1914.

Invoice No. 184. Your Order No. Verbal. Terms Cash.

SOLD TO E. J. Gulick, Mishawaka, Indiana.

Via

Subject to sight draft at maturity

Our Order No.

Shipped -

9

1 Model E K Toy Tonneau Car #747, Engine # Buda 6 SSU4-7137, Axle #725 Color Black and Gray 36 x 5 Q.D. Cl. Continental Rims, 36 x 5 Knight tires, Combination Rear Gasoline Tank and Tire Carrier, Electric Head Lights and Tail Lamp, Warner Comb. 60 mi Speedometer and Clock, Pantasote Top, Universal Wind Shield and Seat Covers. Car equipped with Westinghouse Electric Starting and Lighting System and Mea Dual Ignition System.

600 00 600 00

Received Payment. Amplex Mfg. Co. Per R. W. RANDALL

Miles on Speedometer 816 New type pistons in motor

All claims against this invoice must be made upon receipt of goods

(Pencil Notation on Back)

R. Jeruegan,

This mileage 6112 when car was left in garage and was not driven but little after until Cook received it.

E. J. GULICK.



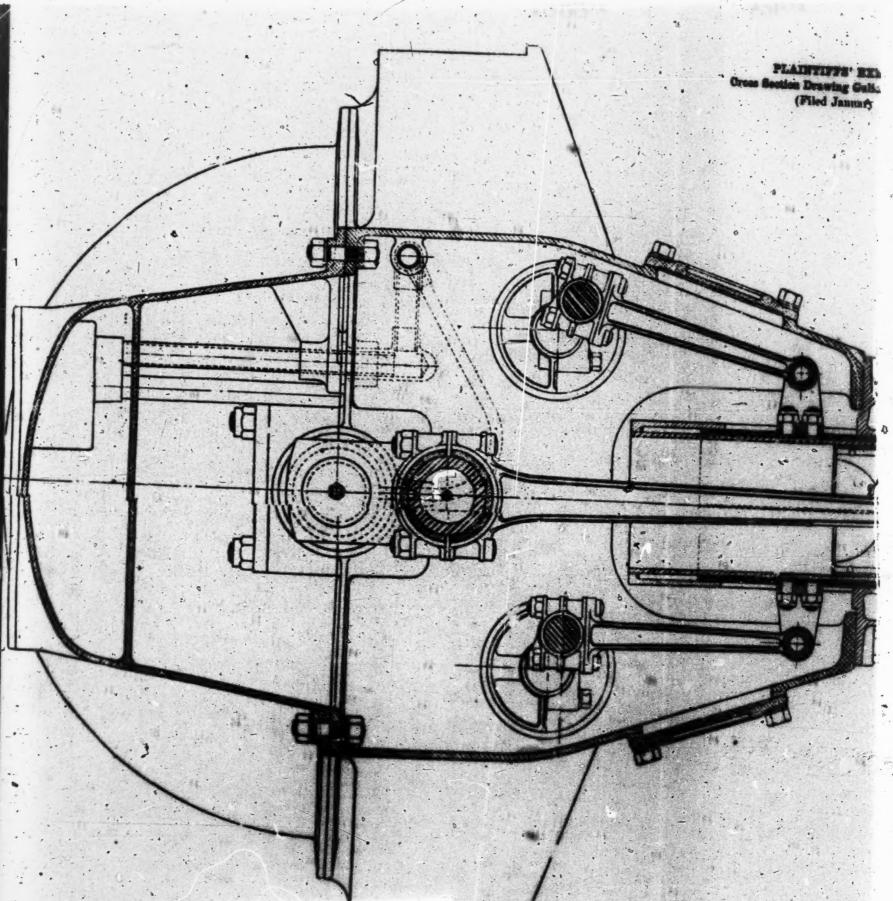
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JAN 27 1934

Al O'clock M.
F. J. DENZLE N. Clerk
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A

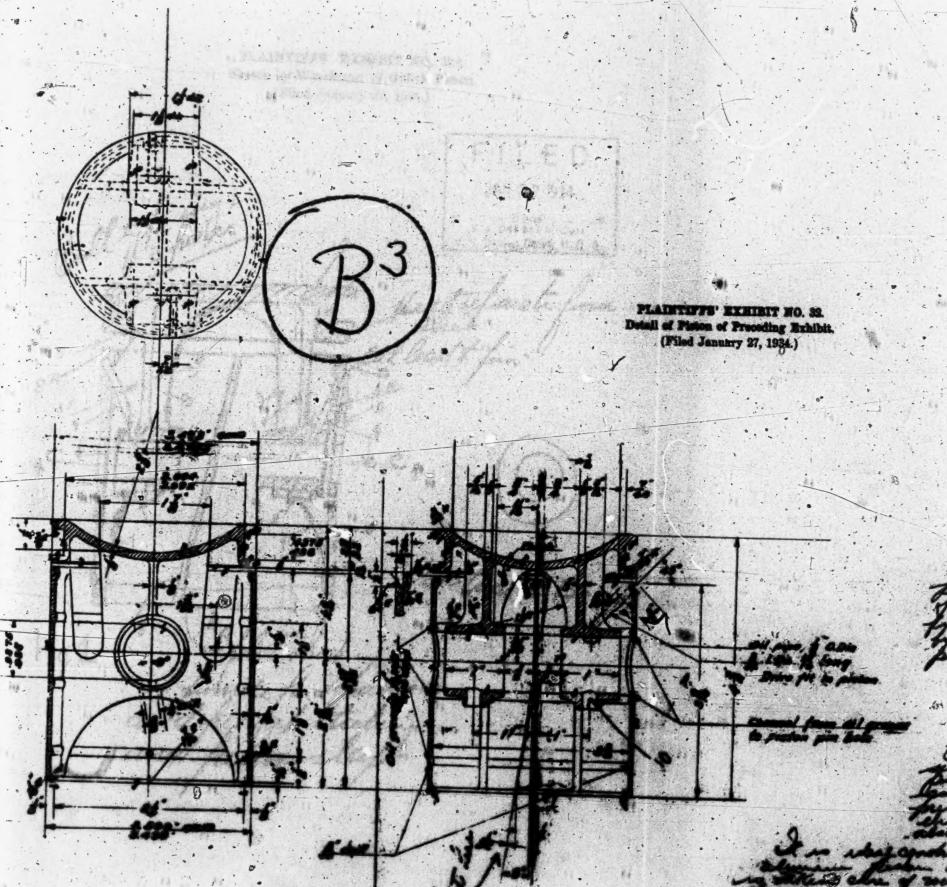
PLAINTIPPO' EXCIPITY NO. 50. Shotch by Randall of Onlink Plains. (Filed January 27, 1904.)



PLAINTIPPS' EXHIBIT NO. 31.

Oross Section Drawing Gulick Sleevs Valve Motor. .

(Filed January 27, 1934.)



efrond. INTIFFE' EXHIBIT NO. 32 of Piston of Preceding Exhibit. (Filed January 27, 1934.) Can there Type KEP .

PLAINTIFFS' EXHIBIT NO. 38A. Skotch by Winchester of Guliek Piston. (Filed January 27, 1934.)

PLAINTIPPS' EXHIBIT MO. 35R.
Sketch by Winehester of Gulick Piston.
(Filed January, 27, 1934.)

FILED

F J DENZLER CHIP

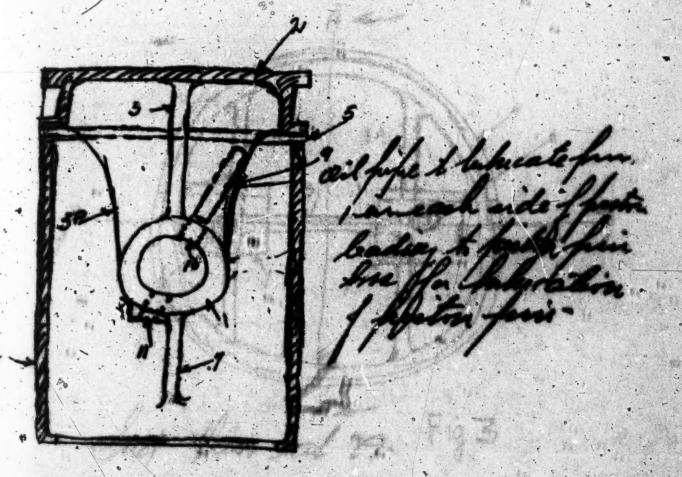
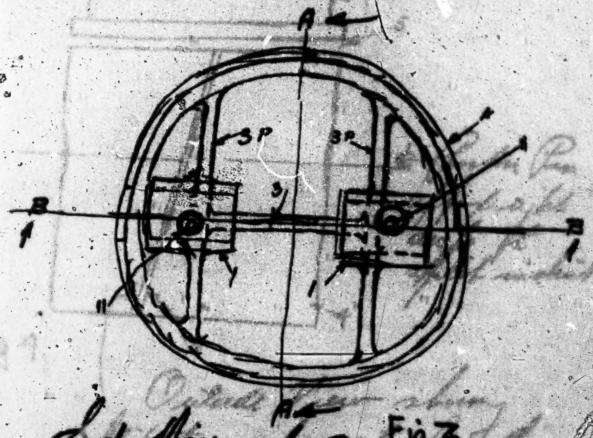


Fig. 2. Section A.

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FILED JAN 2 7 1934

PLAINTIPYS' EXHIBIT NO. Skotch by Windowsker of Gallet (Filed January 27, 1934.)



PLAINTIPPS' EXHIBIT NO 36D. Shotch by Winchester of Gullok Pieton. (Filed January 27, 1984.)

FILED

JAN 2 7 1934

P. J. DER ZLER Clerk U. S. District Court, H. D. O.

Fig 4.

Ontack View shing bet of any house to for typeness PLAINTIPPS' EXHIBIT NO. 262. Shotch by Windhester of Gulick Pleton (Filed January 27, 1934.)

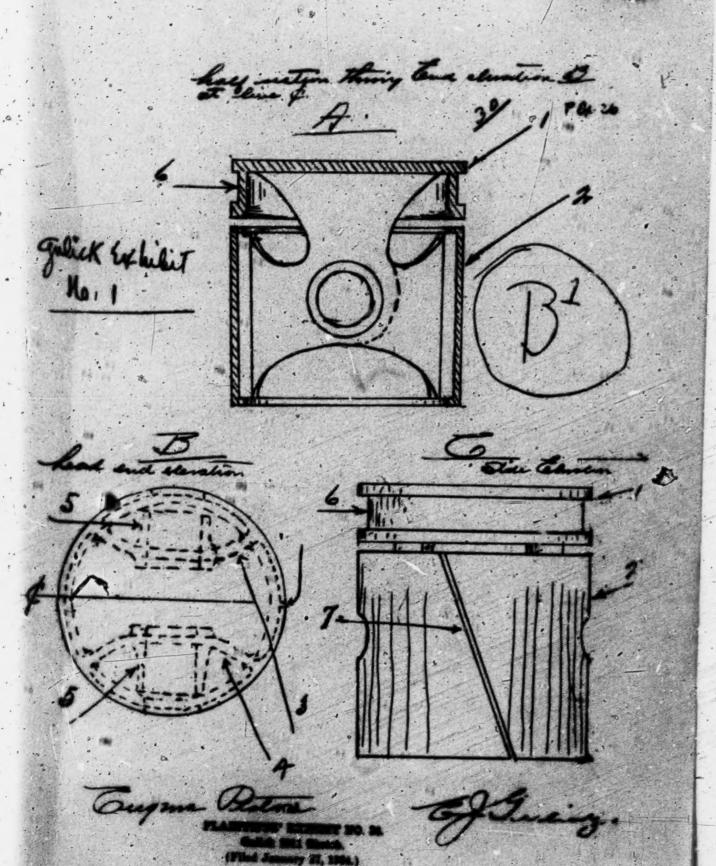
FILED

JAN 27 1934

U. S. Distrist Court N. D. O.

36

Section C.C. bothing toward beard



PLAINTIFFS' EXHIBIT NO. 37.

Gulick Written Description.

(Filed January 27, 1934.)

Relating to an Engine Piston which provides for and prevents seizing binding or scoring when hot or oversize. It is a well known fact that all engine Pistons are necessarily made smaller than the cylinders in which they operate to provide for lubricant and prevent seizing or cutting due to the expansion of the piston in the cylinder when hot.

1. The Piston consists of a Head 1—having a groove 6—for carrying packing Rings and a Body 2 which provides Bearing surface and which is split as indicated by

7 to provide for expansion.

2. The Head 1 and Body 2 are held together by the ribs 3 and 4. Ribs 3 and 4 carry Bosses 5 for receiving the piston pin. Ribs 3 and 4 are not limited to shape or position and the no of ribs and location and shape

may be altered as desired.

The head 1 is machined small enough to allow for expansion and not bind or seize, while the Body 2 is machined as close to size as is possible to make a fit and any expansion is taken up by the slot 7—and which prevents any seizing or Binding between the piston and cylinder walls in which the piston moves. By this construction it is possible to make a fit that prevents any pounding which is prevalent with the common type of Piston.

PLAINTIPPS' EXHIBIT NO. 38a. '6

Supplemental Contract between The Cleveland Trust Company and Aluminum Company of America dated April 26, 1984.

[Also offered as Defendants' Exhibit 4-T.]
(Filed January 27, 1934.)

This AGREMENT made and entered into this 26th day of April, 1924, by and between The CLEVELAND TRUST COMPANY, of Cleveland, Ohio, hereinafter sometimes called the licensor, and ALUMINUM COMPANY OF AMERICA, a Pennsylvania corporation of Pittsburgh, Pa., hereinafter sometimes called the licensee.

WITNESSETH:

Whereas, the parties hereto have of even date entered into a contract hereinafter sometimes called the license agreement, a copy of which is attached hereto and marked Exhibit "B," and to which this contract is a supplement.

Now, THEREFORE, in consideration of the premises and of the covenants and agreements of the parties here-to made herein and in the license agreement, a copy of which is attached hereto and marked Exhibit "D," said parties have covenanted and agreed, and do hereby covenant and agree with each other further as follows:

- 1. In case the royalty per piston payable by any sublicensee to the licensee, under the license agreement, is established at less than one cent (\$.01) per piston by Board of Arbitration or others acting beyond the control of the licensee, the licensor shall accept the royalty so set at less than one cent (\$.01) per piston as a royalty in full to be paid by the licensee hereunder for all pistons made and/or sold by such sub-licensee.
- 2. The licensee shall make vigilant effort to collect all royalties accruing from the sub-licensees under their sub-licensees, respectively. If the licensee is unable, after the exercise of due diligence, to collect royalties due from any sub-licensee, the licensee will be relieved from paying to the licensor the licenser's proportion of such uncollectable royalties, and if the licensee has advanced to the licensor any royalties which prove to be uncollectable, the licensor will refund to or credit the licensee with the amount of such uncollectable portion so advanced. After the licensee has notified the licensor that any royalties are uncollectable, the licensee will, upon

demand in writing from the licensor, assign the licensor's proportion of such uncollectable account to the licensor.

3. In case the license agreement is cancelled for any reason whatsoever other than because of failure of the licensee to carry out its obligations or any of them to the licenser thereunder, the licenser agrees to reassign to the licensee all patents, patent applications or other patent rights which have been assigned by the licensee to the licensor under said license agreement (Exhibit "D" attached hereto), subject, however, to any and all licenses and sub-licenses which have been granted either by the licenser or the licensee or which the licenser is under contract to grant with respect to such patents, patent applications or other patent rights to (1) Walker M. Levett Company and W. M. Levett Corporation of New York; (2) The National Piston Company, Incorporated, of New York and (3) The Kant-Skore Piston Company, of Cincinnati, Ohio, copies of which contracts are hereto attached and marked Exhibits E, F and G, respectively.

In Witness Whereof the parties hereto have caused this instrument to be executed in duplicate by their respective officers hereunto duly authorised as of this 26th day of April, A. D. 1924.

THE CLEVELAND TRUST COMPANY, By A. R. Hore,

Vice President.

Attest:

A. J. PERFLER,
Ass't. Tr. Officer.

ALUMINUM COMPANY OF AMERICA, By W. P. King,

Vice President.

Attest:

G. R. GIBBONS, Secretary, STATE OF OHIO, COUNTY OF CUNAHOGA, SE.:

On this 26 day of April, 1924, personally appeared before me A. R. Hors and A. J. Perfler, to me known to be, respectively, the Vice-President and Assistant Trust Officer of The Cleveland Trust Company, Cleveland, Ohio, and acknowledged to me that they executed the foregoing instrument on behalf of the said Company and for the uses and purposes therein set forth.

ROBERT M. BOYD.

(Notarial Seal)

Notary Public.

STATE OF OHIO, CUYAHOGA COUNTY, 88:

On this 26 day of April, 1924, personally appeared before me W. P. King to me known to be, the Vice President of Aluminum Company of America and acknowledged to me that he executed the foregoing instrument on behalf of the said Company and for the uses and the purposes therein set forth.

(Notarial Seal)

JOHN H. WATSON, JR., Notary Public.

STATE OF PENNSYLVANIA, COUNTY OF ALLEGHENY, 88:

On this 26th day of April, 1924, personally appeared before me G. R. Gibbons to me known to be, the Secretary of Aluminum Company of America, and acknowledged to me that he executed the foregoing instrument on behalf of the said company and for the uses and purposes therein set forth.

(Notarial Seal)

M. D. WEDNER,
Notary Public.

My commission expires March 21st, 1925.

PLAINTIPPS' EXHIBIT NO. 38b.

License Agreement between The Cleveland Trust Company and Aluminum Company of America.

[Also offered as Defendants' Exhibit 4-S.]

(Filed January 27, 1934.)

LICENSE AGREEMENT

This license agreement made and entered into by and between The Cleveland Trust Company, of Cleveland, Ohio, hereinafter called sometimes the licensor, and Aluminum Company of America, a Pennsylvania corporation, hereinafter sometimes called the licensee, witnesseth:—

WHERBAS, the Licensor owns the entire right, title and interest in and to the following Letters Patent and applications for Letters Patent in the United States—

Number	Patentee	Date
1,092,870	Spillman & Mooers	April 14, 1914
1,279,184	J. G. Vincent	Sept. 17, 1918
1,293,846	H. C. Marmon	Feb. 11, 1919
1,327,147	Harold D. Church	Jan. 6, 1920
	L. P. Mooers	July 27, 1920
1,402,308	L. P. Mooers	Jan. 3, 1922
1,402,309	L. P. Mooers	Jan. 3, 1922
Ser. No. 204,661	E. J. Gulick, Filed	Nov. 30, 1917, and

has arranged to acquire the entire right, title and interest in and to Letters Patent 1,153,902 dated September 21, 1915, to Gustave E. Franquist and.

Whereas, the licensor may acquire other United States patents, patent applications and patent rights relating to pistons, and/or the processes and/or the machines for making the same, during the life of this agreement; and

Wheneas, the said licensee is desirous of acquiring a license to make, use and sell the inventions included in the said patents and applications acquired and to be acquired by the licensor for the full term for which said patents are or shall be granted.

Now, Themseons, in consideration of the premises and of the ecvenants and agreements of the parties hereto, respectively as hereinafter set forth, said parties have covenanted and agreed, and do hereby covenant and agree with each other as follows:

The Licensor grants the licensee the exclusive right to make, use and sell and the exclusive right to grant to others the right to make, use and sell, the inventions and devices embodying the inventions covered by the patents and applications above named or to be covered by any continuations and divisions renewals or reissues of the same, for the full term of each of said patents, with the exception that the licensor reserves to itself the right to make, use and sell and the right to grant to others the right to make, use and sell pistons made entirely of cast iron or steel, and it is specifically agreed that the licensor neither grants nor agrees to grant to the licensee in this agreement the exclusive right to make use or sell pistons made entirely of cast iron or steel, it being understood that the licensee has hereunder a non-exclusive license to make, use and sell, and the right to grant to others the right to make, use and sell cast iron or steel pistons embodying the inventions covered by the patents and applications above named, or to be covered by any continuations and divisions, renewals or reissues of the same, for the full term of each of said patents. This license and agreement will be automatically 'extended to cover any other and further patents or applications or other rights under patents which the licensor may acquire relating to pistons and/or processes and/or machines for making the same, unless excluded therefrom by the licensee as hereinafter provided, and the licensor agrees to execute any further instruments and perform any further acts, if any are required, to consummate the granting of licenses to the licensee or parties indicated by the licensee under this agreement. This license is subject to a license granted by The Cleveland Trust Company to Nordyke & Marmon Company, April 23, 1920, a copy of which is attached hereto marked Exhibit A.

11.

The Licenser releases and discharges the Licensee, all of its controlled and subsidiary companies, and Aluminum Manufacturers, Inc., and The Aluminum Castings Company, all sub-licensees under this agreement and all vendees and/or users of pistons, the castings for which were heretofore acquired from the Licensee or either of the said companies, or said sub-licensees, from any and all claims whatsoever for damages or profits by reason

of any alleged past infringement of any of the patents aforesaid now owned by the Licensor and arising out of the manufacture, use and sale of such pistons; and from any claim or claims for past damages or profits which shall be acquired by the Licensor in the future, during the continuance of this agreement, and theretofore arising out of the manufacture, use and sale of such pistons; and agrees not to institute or to aid or abet the institution of any quit against the Licensee or any of its controlled and subsidiary companies, or Aluminum Manufactures, Inc. or The Aluminum Castings Company, or sub-licensees, or the vendees or users of pistons, the castings for which were heretofore acquired from the Licensee or either of the said companies, or said sub-licensees, for any alleged past infringement of any patents relating to the subjects covered by the patents or applications named herein or for damages and profits because of alleged past infringement thereof and heretofore arising out of the manufacture, use and sale of such pistons.

Ш

- 1. (a) The Licensor shall institute and prosecute to a conclusion with due diligence suit or suits against any or all infringers of the patents included within the terms of this agreement necessary reasonably to protect the interests of the licensee acquired hereunder, provided that the licensor be indemnified to its satisfaction by the licensee for any costs or expenses which the licensor may suffer or sustain in connection with or growing out of any such suit.
- (b) The licensor shall defend any suit or suits, so far as such defence shall be necessary reasonably to protect; the interests of the licensee acquired hereunder, brought because of the alleged infringement of any letters patent covering the design of pistons made, sold or used under this agreement and for which royalties are paid under this agreement, provided that the licensor be indemnified to its satisfaction by the licensee for any costs or expenses which the licensor may suffer or sustain in connection with or growing out of any such defense.
- 2. Should the licensor bring and prosecute or defend as above provided such infringement suit or suits at its own expense, all profits or damages recovered in said suit or suits shall be the absolute property of the licensor.

3. In the event of the failure of the licensor promptly to institute and vigorously prosecute or to defend such suit or suits as may be necessary reasonably to protect the interests of the licensee hereunder, then and in that event, the licensee having reasonably indemnified the licensor, may in the name of the licensor or the names of the licensor and licensee jointly institute or adopt and diligently prosecute or defend at the licensee's expense such suit or suits as may be required reasonably to protect its interests. The licensor at any time shall have the right to join in the prosecution or defense of such suit or suits with its own counsel and at its own expense.

4. Should the licensee bring or prosecute or defend as above provided any such infringement suit or suits or should the licensee furnish indemnification to the licensor in connection with suits brought or prosecuted or defended by the licensor and pay any sum on account of such indemnification, it shall have the right to apply all royalties payable by it on the reasonable costs and expenses of such suit or suits, including attorney's fees, or on said sum paid on account of indemnification and shall apply the sum, if any, recovered in any such suit, first, to the reimbursement of it for said reasonable expenses and costs, including attorney's fees, and not theretofore reimbursed to if out of royalties of sums paid on account of indemnification, and second, to the payment to the licensor of all sums theretofore deducted by the licensee from royalties and applied to the said reasonable costs and expenses, including attorney's fees, of such suit or payments of indemnification and the balance shall be the absolute property of the licensee.

IV.

The Licensee agrees that it will within the months of January, April, July and October of each year from and after the execution hereof, furnish to the licensor, its successors or assigns in interest, a written statement under oath which shall show:—

(a) the number of pistons made by or for it, imported by it and sold or otherwise disposed of by it during the preceding three calendar months which contain or which to the licensee's knowledge are to be modified or fabricated by the licensee's vendees to contain and embody any invention covered by any of the claims of any of the letters patent and application recited herein, or in the future

acquired by the licensor and included herein. This report shall be made whether the licensee makes or sells say pistons during the preceding royalty period, or not, and

(b) the number of such pistons sold by the licensee and for which the vendee has been subsequently credited.

The first report shall include the pistons contemplated in this paragraph between January 1, 1924 and April 1, 1924.

V.

The Licensee will pay the licensor royalty of one cent (\$.01) upon each piston sold or otherwise disposed of by it during the life of this agreement embodying in its construction any invention covered by one or more of the claims of the letters patent and application named herein or in the future acquired by the licensor and added hereto, and upon each piston made and sold by the licensee with the intention or the knowledge of the licensee that it shall be modified or fabricated by the licensee's vendee in such a way as to embody in its construction any invention covered by one or more of the claims in the letters patent or applications covered hereby.

It is understood that no royalties will be payable or collectible upon the licensed pistons which have been sold and for which the vendee thereof has been subsequently credited, and that if any royalties have been paid upon the licensed pistons which are sold, and for which the vendee has been subsequently credited, the licensee shall have credit therefor upon the next due payment.

VI.

Within thirty (30) days after it shall have furnished, in January, April, July and October of each year, statements specified in the paragraph herein numbered (IV), the licensee shall and will pay to the licensor, its successors or the assigns of its interest in said letters patent, the royalties upon the pistons covered by said reports, at the rate prescribed.

^{*}Sold in this contract means and includes only licensed pistons which are both contracted for and delivered, during the life of this agreement.

The licensee agrees that it will keep accurate books of account, giving full particulars of the licensee's business in the inventions covered by this agreement and will in the event of controversy admit the licensor or its duly accredited agent at all reasonable times to inspect the same.

VIII.

In the event that the combination set forth in any of the claims of the application for letters patent and of the letters patent to be granted thereon above recited and the letters patent above recited or acquired in the future and added hereto is held by a court of final jurisdiction or by an inferior court from whose decree no appeal is taken or the appeal is denied or dismissed, to be an infringement of any other patent in any patent suit brought in the United States against the licensor, the licensee, any other of the licensor's Licensees, any sublicensees or any of its or their vendees, the licensee shall have, and is hereby given, the right and option to exclude from this license any such claim or claims or the letters patent or application for letters patent containing such claim or claims, as the case may be, and to have the royalty payable hereunder reduced proportionately if any, to the reduction, caused by such judicial holdings in the value of the patents and applications comprehended by this agreement, such proportion to be determined by arbitration as hereinafter in paragraph (XX) hereof provided, or to terminate this agreement altogether by giving to the licensor notice in writing of its election so to do within six (6) months from the rendition of the judicial holding of the court of final jurisdiction or after the expiration of the time for appeal or after the appeal has been denied or dismissed.

IX.

The licensor authorizes and empowers the licensee to grant sub-licenses to manufacture, make, use and/or sell within the United States pistons which contain and embody any inventions covered by any of the claims of any of the letters patent and applications for letters patent comprehended herein; provided that each and every such sub-license so granted shall expressly refer to this license, shall be of no greater scope than this license and shall terminate therewith; and provided further that all

royalties payable by the sub-licensee shall be payable directly to the Aluminum Company of America or its order and the proportion thereof due to the licensor, namely, one cent (\$.01) per piston, shall be payable forthwith to the licensor by the licensee hereunder.

This agreement and license shall be transferable to the successors or assigns of either of the parties hereto, but in that event the successors or assigns shall be bound by the provisions of this agreement and obligated to conform thereto.

The licensee will not during the life of this agreement contest, or aid others in contesting the validity of any of the letters patent included within this agreement or afterwards acquired by the licensor and included in this agreement.

The licensee can have and hereby is given the right and option to exclude from this license any letters patent or application for letters patent or other patent rights which the licensor may acquire after the execution of this license provided the licensee gives the licensor notice in writing of such exclusion within ninety (90) days after notice in writing to the licensee by the licensor of the acquisition of any letters patent or applications or other patent rights, not recited in this agreement.

XIII.

The licensee shall pay royalties only upon pistons both contracted for and delivered during the term of this license, pistons contracted for before or delivered after the term of the contract are free of royalties.

XIV.

If either of the parties hereto neglects or refuses to keep any of its covenants herein, then the other party hereto may serve on the devellet party by registered mail a notice in writing of such default and if the devellet party shall continue such default for thirty (30) days after the serving of such notice, then the aggrieved party may at its option cancel this license by a notice in writing of such cancellation and termination, provided, how-

ever, that the foregoing remedy shall not exclude any other remedy which the aggrieved party may have at law or in equity. The waiver of any breach by either party shall not be interpreted as constituting a waiver of any further breach or breaches.

XV

The licensor hereby grants to the licensee the exclusive right to make, use and sell the inventions covered by any foreign patents or applications for foreign patents, which the licensor now owns or controls which relate to pistons with the exception that the licensor reserves to itself the right under such foreign patents to make, use and sell and the right to grant to others the right to make, use and sell pistons made entirely of cast iron or steel. The licensor agrees to release the licensee, its subsidiary and controlled companies, the Aluminum Manufactures, Inc., The Aluminum Castings Company, their vendees, and all users of their pistons, from any claim or claims for alleged infringement of foreign patents, which the licensor now has or in the future may acquire against any of them. It is specifically agreed that the licensor neither grants nor agrees to grant to the hcensee in this agreement the exclusive right to make, use or sell pistons made entirely of cast iron or steel under such foreign patents. It being understood that the licensee has a non-exclusive license under, and the right to license others under such foreign patents to make, use and sell pistons embodying inventions covered by any foreign patents which the licensee now owns or controls when such pistons are made entirely of cast iron or steel. The Licensor agrees, upon demand of the licensee, to execute all instruments and perform all acts necessary to complete the licenses under this paragraph. This license and agreement will be automatically extended to cover any other and further foreign patents or applications for foreign patents or other rights under foreign patents which the licensor may acquire relating to pistons and/or processes and/or machines for making the same, unless excluded therefrom by the licensee as hereinafter provided, and the licensor agrees to execute any further instruments and perform any further acts, if any are required, to consummate the granting of licenses to the licensee or parties indicated by the licensee under this agreement.

XVI.

Should the inventions, for the use of which the Licensee pays royalty under this agreement, be made, sold or used generally by others, in the aluminum piston or automobile trade, not licensed under the patents included in this contract, forthwith upon the finding by arbitration as hereinafter provided that such a condition exists, the Licensee may, at its option, (a) terminate this contract on ninety (90) days notice in writing to the Licensor of its intention so to do, or (b) surrender its exclusive license granted by this contract and retain a non-exclusive right and license to continue the use of the patented inventions without the payment of any royalty therefor until such infringement ceases.

XVII.

The licensee shall have the following privileges and rights:

- (a) At any time within two (2) years after the date of execution of this agreement, upon ninety (90) days' notice in writing to the Licensor of its intention so to do, to cancel this agreement; and
- (b) To surrender this license at the end of two (2), four (4), six (6), eight (8), ten (10) years or any other period consisting of an even number ef years after the date of execution hereof by giving to the licensor notice in writing of its desire and intention so to do at least ninety (90) days prior to the date the license is to be terminated; but any such termination of this license as in this article specified shall not release the license or the licensor, from any obligations theretofore accruing to the opposite party.

XVIII.

The licensee shall use reasonable diligence in manufacturing and/or marketing pistons embodying inventions licensed hereunder, and, in the event that, during the continuance of this agreement, it should not do so, the licenser shall have the following rights, options and privileges exercisable by it forthwith upon the finding by arbitration as hereinafter provided that the licensee has not used and is not using such diligence;

- (a) To cancel or terminate this agreement by giving six (6) months' notice in writing to the said licensee of its desire and intentions so to do; where upon at the expiration of said six (6) months from the date of said notice this agreement shall be terminated.
 - (b) To grant an additional license or licensee under the inventions or improvements, applications for letters patent and letters patents, or any of them, then embraced by and included within the terms of this license.

XIX.

Should the licensee, taking advantage of its privilege under any of the provisions of this contract, elect to terminate this contract and stand out from under the same, the licensee shall not be estopped to deny the validity of any of the patents covered or comprehended by this contract and shall not be deprived of any of the defenses or the rights of a defendant in an ordinary patent infringement suit, but, on the contrary, shall stand in the position of one who had never entered into this contract.

XX.

In the event either party hereto calls for an arbitration as provided for in this contract, each party shall select an arbitrator and the two arbitrators shall select a third arbitrator. In the event that the two arbitrators fail to select a third or in the event either party fails to select its arbitrator, it is agreed that the third and/or second arbitrator may be selected by the district judge of the United States District Court, Northern District of Ohio, Eastern Division, who has then been longest in said office. The three arbitrators thus selected shall constitute the Board of Arbitration and the parties hereto shall submit their contentions to this Board of Arbitrators at a time and in a manner determined by the arbitrators. The decision of any two arbitrators shall be final and binding on the parties hereto. Each party shall bear the expense of its arbitrator and both shall bear the expense of the third arbitrator share and share alike.

· XXI.

The licensor agrees that should it at any time during the life of this agreement grant licenses under the patents, now included or in the future included in this agreement, or under the substantial and material patents new included or to be included in this agreement, at lower rates than one cent (4.01) per piston as provided for herein, or otherwise upon more favorable terms than are provided for herein, then this agreement shall, on the request of the licensee, be modified to make its terms as favorable as these upon which any subsequent license may be granted.

XXII.

The licensee agrees to assign, or cause to be assigned, to the licensor all United States patents and applications for United States patents which it now owns or in the future during the life of this contract acquires or controls relating to pistons per se.

XXIII.

This agreement, in the construction of which the laws of the State of Ohio shall govern, is made by the Licensor under title conveyed by or acquired under and subject to the terms, provisions and conditions of a certain Conveyance, Declaration of Trust and Agreement entered into as of the 7th day of March, 1922, by and between Louis P. Mooers and George B. Pitts and The Cleveland Trust Company, Trustee, the Licensor herein, a copy of which is on file at the principal office of said The Cleveland Trust Company in the City of Cleveland, and open to the inspection of the Licensee, and unless terminated as hereinbefore provided, shall terminate with the date of expiration of the last Letters Patent now or hereafter embraced in said Declaration of Trust and Agreement.

In Wrrams Wannor, the parties have caused this instrument to be executed in duplicate by their respec-

Pistons per se means pistons whose patentability depends upon physical, structural characteristics of the piston and not upon the character of the material in the piston or the molds, machines or the processes by which the piston is made.

tive officers hereunto duly authorized as of this 26th day of April, A. D. 1924.

THE CLEVELAND TRUST COMPANY,

By R. A. MALM,

Vice President.
(Corporate Seal)

Attest:

A. J. PERFLER,

Ass't. Tr. Officer.

ALUMINUM COMPANY OF AMERICA,
By W. P. King,

Vice President.

Attest:

G. R. Gibbons, Secretary.

(Corporate Seal)

Approved for Execution by The C. T. Co.

R. T. S., Counsel.

STATE OF OHIO,

COUNTY OF CUYAHOGA, SS:

On this 11th day of April, 1924, personally appeared before me R. A. Malm and A. J. Perfler, to me known to be, respectively, the Vice-President and Assistant Trust Officer of The Cleveland Trust Company, Cleveland, Ohio, and acknowledged to me that they executed the foregoing instrument on behalf of the said Company and for the uses and purposes therein set forth.

ROY F. HAGGETT,

(Notarial Seal)

Notary Public.

STATE OF OHIO, CUYAHOGA COUNTY, 88:

On this 26th day of April, 1924, personally appeared before me W. P. King to me known to be, the Vice President of Aluminum Company of America and acknowledged to me that he executed the foregoing instrument on behalf of the said Company and for the uses and the purposes therein set forth.

JOHN H. WATSON, JB., Notary Public. STATE OF PRINSYLVANIA, COUNTY OF ALLEGEBRY, 88:

On this 26th day of April, 1924, personally appeared before me G. R. Gibbons, to be known to be, the Secretary of Aluminum Company of America, and acknowledged to me that he executed the foregoing instrument on behalf of the said company and for the uses and purposes therein set forth.

M. D. WEDNER,

Notary Public.

My commission expires March 21st, 1925.

EXHIBIT A.

LICENSE AGREEMENT

This Agreement made this 23rd day of April, 1920, between The Cleveland Trust Company, a corporation of the State of Ohio, hereinafter called the Licensor, and Nordyke & Marmon Company, a corporation of the State of Indiana, hereinafter called the Licensee.

WITNESSETH, that

Whereas, the Licensor owns and holds title to the following: (a) Letters Patent of the United States No. 1,092,870, patented April 14, 1914, to E. O. Spillman and L. P. Mooers, for Piston for Explosion Engines or Motors; (b) application for Letters Patent of the United States, Sr. No. 106,502 and 106,503, filed June 28, 1916, by Louis P. Mooers for Pistons for Internal Combustion Motors; and (c) also owns and has title to all claims for damages and profits arising out of past infringement by the Licensee of said Letters Patent, and

Whereas, the Licensee is desirons of acquiring a license under said Letters Patent and those which may be granted upon the aforesaid applications for Letters Patent:

Now, Therefore, for and in consideration of the premises, of the covenants and agreements of the parties hereto, respectively, as heroinafter set forth, and in further consideration of the assignment of Letters Patent of the United States No. 1,293,846, dated February 11, 1919, to Licensor, by Howard C. Marmon, the parties hereto have covenanted and agreed, and do hereby covenant and agree with each other, as follows:

A. The Licensor, on its part, does hereby:

- (1) Grant to the Licensee the right and license, not exclusive, to manufacture, have manufactured for it, assemble, and use in and sell for use in Licensee's engines, mechanism and apparatus having and containing any or all of the inventions shown, described and claimed in the above recited Letters Patent and applications for Letters Patent and the Letters Patent of the United States which may be granted upon the latter, or either of them.
 - (2) Release and discharge the Licensee and all who have sold or used the product of the Licensee from any and all claims whatsoever for damages and profits arising by reason of infringement of said Letters Patent by Licensee's product.

B. It is understood and mutually agreed that:

(1) This license is not divisible and is not assignable by the Licensee excepting to a successor in business of the Licensee.

(2) This agreement is made by the Licensor subject to the terms, provisions and conditions of a certain Declaration of Trust and Agreement entered into, in writing, as of the date of August 4, 1917, by and between Louis P. Mooers and George B. Pitts, as Grantors, and The Cleveland Trust Company, ct al., as Trustee, including Article F-2 thereof, which reads:

"2. No debt or liability shall be incurred by the Trustee, either collectively or individually, except such as may be incidental to the management and development of said 'Property' and the Trustee shall have no power to bind the beneficiaries hereunder, or any of them personally; and in every written contract which the Trustee, or either of them, shall authorize, enter into or make, reference shall be made to this Declaration of Trust; and each person or corporation contracting with the Trustees, or either of them, shall look to the funds and 'Property' of the Trust for payment under such con-

tract or for the payment of any debt, judgment or decree, or of any money that may otherwise become due and payable; and neither of the Trustees, nor any beneficiary hereunder, shall be personally liable therefor."

A copy of which Agreement is on file at the principal office of said The Cleveland Trust Company in the City of Cleveland, Ohio, and open to inspection of the Licensee.

In Testimony Whereor, said parties have hereunto set their hands and seals by their respective officers hereunto duly authorized by said The Cleveland Trust Company and said Nordyke & Marmon Company, respectively, the execution being at the places and on the dates appearing under their respective names below.

THE CLEVELAND TRUST COMPANY, By E. L. MASON,

Vice President.

Attest:

E. B. MERRELL,

A-Secretary.

Cleveland, Ohio,

Dated: May 6th. 1920.

NORDYKE & MARMON COMPANY, By W. C. MARMON, President.

Attest:

H. G. SHAPER, Secretary.

Indianapolis, Indiana.

Dated April 23rd, 1920.

STATE OF OHIO, COUNTY OF CHYAHOGA, SE:

On this 6th day of May, 1920, personally appeared before me E. L. Mason and E. B. Merrell to me known to be, respectively, the Vice-President and Asst. Secretary of The Cleveland Trust Company, of Cleveland, Ohio, and acknowledged to me that they executed the foregoing instrument on behalf of the said Company and for the uses and purposes therein set forth.

Roy F. HAGGETT, Notary Public. STATE OF INDIANA, COUNTY OF MARION, SS:

CHARLES W. REESE.

My commission expires Feb. 5, 1923.

PLAINTIFFS' EXHIBIT NO. 38c.

License Agreement between Walker M. Levett Co., W. M. Levett Corp., Walker M. Levett and The Cleveland Trust Company, dated April 11, 1924.

(Filed January 27, 1934.)

AGREEMENT

This Agreement made and entered into this 11 day of April, 1924, by and between Walker M. Levett Company and W. M. Levett Corporation, both being corporations of the State of New York and Walker M. Levett, of New York City, jointly and severally, (hereinafter referred to as parties of the first part) and The Gleveland Trust Company, of Cleveland, Ohio, a corporation of the State of Ohio, (hereinafter referred to as the Trust Company).

WITNESSETH:

Whereas, the Parties of the First Part own the entire right, title and interest in and to applications for Letters Patent of the United States, Serial No. 470,502, filed May 18, 1921 of Gustav R. Kelm; and

Whereas, parties of the first part desire, under certain conditions, to dispose of their interest in and to the said application for patent and in any other patents or applications for Letters Patent relating to pistons per se which they may own wholly or in part, or subsequently acquire, and

Whereas, the Trust Company desires to obtain the entire right, title and interest in and to the said application for letters patent and the entire right, title and interest possessed by the parties of the first part, and each of them, in and to any other patents or applications relating to pistons per se now owned or subsequently acquired by the parties of the first part together with certain rights to past infringements of the said patent or patents and application or applications.

Now, THEREFORE, in consideration of the covenants. and agreements of the parties hereto, respectively as hereinarter set forth, said parties have covenanted and

Pistons per se means pistons whose patentability depends upon physical, structural characteristics of the piston and not upon the character of the material in the piston or the molds, machines or the processes by which the piston is made.

agreed, and do hereby covenant and agree with each other as follows:

1. The Parties of the First Part agreed to sell, assign, transfer and set over to and hereby do sell ssign, transfer and set over to The Cleveland Trust Company as trustee under a certain conveyance, Declaration of Trust and Agreement dated March 7, 1922, copy of which attached, marked "Exhibit A" and another copy of which is on file with The Trust Company, the entire right, title and interest in and to said application for Letters Patent Serial No. 470,502 and the entire right, title and interest possessed by the Parties of the First Part, and each of them, in and to any Letters Patent or applications for Patent relating to pistons per se now owned, held, wholly or in part, on the date of the execution of this agreement or subsequently acquired; together with the right to sue and collect for all past infringements of the said patent or patents, or of any patent or patents issuing from such application or applications, and to collect damages and profits arising out of such infringement and apply the same to the benefit of The Cleveland Trust Company, as trustee.

2. The Parties of the First Part hereby agree for themselves, their respective executors and legal representatives, to execute and deliver to The Cleveland Trust Company, as trustee, any and all other papers or documents necessary or desirable more fully to convey to The Cleveland Trust Company, as trustee, the entire right, title and interest in and to the said applications, and Letters Patent when, and as, the same may be requested by The Cleveland Trust Company as trustee, and to do any and all further acts which may be desirable or necessary more effectually to secure to or vest in The Cleveland Trust Company, as trustee, its successors and assigns the entire right, title and interest in and to the said invention, Letters Patent and applications hereby sold, assigned and transferred or intended so to be.

3. The Parties of the First Part hereby agree for themselves, their respective executors and legal representatives, to assign to The Cleveland Trust Company, as Trustee, without further consideration the entire right,

PRINTER'S NOTE:

The "Exhibit A" referred to above was not attached to Exhibit 38c.

Patent or application relating to pistons per se which they may in the future acquire forthwith upon obtaining the same together with whatever rights they may acquire to sue and collect for past infringement thereof and to apply any damages and profits so recovered to the benefit of The Cleveland Trust Company as trustee.

C' - mil and and

- 4. In case the sub-license from the Aluminum Company of America to the parties of the first part, a copy of which is attached hereto, made a part hereof and marked "Exhibit B," is canceled or terminated for any reason whatsoever, excepting the failure of parties of the first part reasonably to comply with their obligations' thereunder, and said parties of the first part forthwith applied to whomsoever then holds or controls as owner or exclusive licensee, the inventions, applications for Letters Patent and Letters Patent embraced by such sublicense, for another sub-license upon terms at least as favorable for parties of the first part as those in said sub-license "B" contained, and such owner or exclusive licenses as the case might be, fails to execute or deliver to parties of the first part such a sub-license within thirty (30) days from the date of such application by said parties of the first part, then and in that event, this agreement shall be deemed and construed henceforth to operate as such a sub-license having the terms and conditions of the sub-license, Exhibit "B," applicable for such purpose and said parties of the first part shall account thereunder directly to The Trust Company.
- 5. This agreement, in the construction of which the laws of the State of Ohio shall govern, is made by The Trust Company under title conveyed by or acquired under and subject to the terms, provisions and conditions of said Conveyance, Declaration of Trust and Agreement of which "Exhibit A" is a copy.

PRINTER'S NOTE:

The "Exhibit B" referred to above was not attached to Exhibit 38e.

IN WIENESS WHEREOF the parties hereto have set their hands and affixed their seals this 11th day of April, 1924.

WALKER M. LEVETT COMPANY, W. M. LEVETT,

President.
(Corporate Seal)

ATTEST:

L. E. VALCOURT, Secretary.

W. M. LEVETT CORPORATION,

W. M. LEVETT,

President.

(Corporate Seal)

ATTEST:

L. E. VALCOURT, Secretary.

WALKER M. LEVETT.

A. F. HUSSEY.

THE CLEVELAND TRUST COMPANY, By R. A. MALM,

Vice President.
(Corporate Seal)

ATTEST:

A. J. PERFLER, Ass't. Trust Officer.

Apr 11 1924

Approved for Execution by The C. T. Co.
R. T. S., Counsel.

STATE OF NEW YORK, COUNTY OF NEW YORK, 88.

On this 20 day of March, 1924, at New York City, before me personally appeared Walker M. Levett, to me known, who, being by me duly sworn, made oath that he signed the foregoing instrument and he acknowledged the same to be his free act and deed.

ALLEN C. BAREWELL, Notary Public.

NOTABY PUBLIC:

N. Y. Co. Clerk's No. 30.

N. Y. Co. Register's No. 4129.

Commission expires March 30, 1924.

STATE OF NEW YORK, COUNTY OF NEW YORK, SS.

On this 20th day of March, 1924, at New York City before me personally appeared W. M. Lavarr and L. E. Valcour, to me known, who, being by me duly sworn, made oath that they are the president and secretary, respectively, of W. M. Lavarr Consonation, the corporation described in and which executed the foregoing instrument, and are its agents for this purpose duly authorized, that they signed the same in behalf of said corporation, that the seal affixed to said instrument is the seal of said corporation and was so affixed by authority of the Board of Directors; and they acknowledged the foregoing instrument to be their free act and deed and the free act and deed of said corporation.

ALLEN C. BARRWELL, Notary Public.

NOTARY PUBLIC.
N. Y. Co. Clerk's No. 36.
N. Y. Co. Register's No. 4129.
Commission expires March 30, 1984.

STATE OF NEW YORK, COUNTY OF NEW YORK, 88.

On this 20th day of March, 1924, at New York City before me personally appeared W. M. Lavarr and L. E. Valcourt, to me known, who, being by me duly sworn, made oath that they are the president and secretary, respectively, of Walker M. Lavarr Company, the company described in and which executed the foregoing instrument, and are its agents for this purpose duly authorized, that they signed the same in behalf of said corporation, that the seal affixed to said instrument is the seal of said corporation and was so affixed by authority of the Board of Directors; and they acknowledged the foregoing instrument to be their free act and deed and the free act and deed of said corporation.

ALLEN C. BARRWELL, Notary Public.

NOTARY PUBLIC.
N. Y. Co. Clerk's No. 30,
N. Y. Co. Register's No. 4129.
Commission expires March 30, 1924.

STATE OF OHIO, COUNTY OF CUTAHOGA, 88.

On this 11th day of April, 1924, at ClevelandsOhio, personally appeared before me R. A. Maist and A. J. Prizzan, to me known to be respectively a vice-president and assistant trust officer of The Cleveland Trust Company, of Cleveland, Ohio, and acknowledged to me that they executed the foregoing instrument on behalf of suid Company as Trustee, and for the uses and purposes therein set forth.

Roy F. Haggerr, Notary Public.

PLAINTIPPS! REMIRET NO. 504.

License Agreement between The Haldenst Pinter Company, Contain B. Prinquist, Jenne B. Dissered and The Oliverhand Trust Company, dated April 11, 1994.

(Filed January 27, 1934.

AGREEMENT.

This Agreement made and entered into this 11th day of April, 1924, by and between The Narional Perceivance Company, Incomposition, a corporation of the State of New York, Guerava E. Françouse, of Bochester, N. Y. and James E. Diamond, of Mount Vernon, N. Y. jointly and severally, (hereinafter referred to as Parties of the First Part) and The Cleveland Tauer Company of Cleveland, Ohio, a corporation of the State of Ohio, (Hereinafter referred to as the Trust Company).

WITHERETH:

Wheneas, the Parties of the First Part own the entire right, title and interest in and to United States Letters Patent, No. 1,153,902, issued September 21, 1915, to Gustave E. Franquist and

Whereas, Parties of the First Part desire, under certain conditions, to dispose of their interest in and to the said patent and in any other patents or applications for Letters Patent relating to pistons per se which they may own wholly or in part, or subsequently acquire, and

Wheneas, The Trust Company desires to obtain the entire right, title and interest in and to the said patent to Fanquist and the entire, right, title and interest possessed by the Parties of the First Part, and each of them, in and to any other patents or applications relating to pistons per se now owned or subsequently acquired by the parties of the First Part together with certain rights to past infringements of the said patent or patents and application or applications.

Now, THEREFORE, in consideration of the covenants and agreements of the parties hereto, respectively, as hereinafter set forth, said parties have covenanted and agreed, and do hereby covenant and agree with each other as follows:—

^{*}Pistons per se means pistons whose patentability depends upon physical, structural characteristics of the piston and not upon the character of the material in the piston or the molds, machines or the processes by which the piston is made.

1. The Parties of the First Part agree to sell, assign, transfer and set over to and hereby do sell, assign, transfer and set over to The Cleveland Trust Company as trustee under certain Conveyance, Declaration of Trust and Agreement dated March 7, 1922, a copy of which is attached, marked "Exhibit A" and another copy of which is on file with the Trust Company, the entire right, title and interest in and to United States Letters Patent No. 1,153,902, issued September 21, 1915, and the entire right, title and interest possessed by the Parties of the First Part, and each of them, in and to any Letters Patent or applications for Patent relating to pistons per se now owned, held, wholly or in part, on the date of execution of this agreement or subsequently acquired; together with the right to sue and collect for all past infringements of the said patent or patents, or of any patent or patents issuing from such application or applications, and to collect damages and profits arising out of such infringement and apply the same to the benefit of The Cleveland Trust Company as trustee; except that this assignment does not convey or intend to convey to The Trust Company the right to sue for and collect for past infringement of said Franquist patent by Walker M. Levett or The W. M. Levett Corporation, or the Walker M. Levett Company, of New York City.

2. The Trust Company hereby agrees forthwith upon the execution of this agreement to issue in the name of and transfer to the said Parties of the First Part, or their nominee or nominees, three hundred (300) shares in the beneficial interest created by said Conveyance, Declaration of Trust and Agreement, of which

"Exhibit A" is a copy.

3. The Parties of the First Part hereby agree for themselves, their respective executors and legal representatives, to execute and deliver to The Cleveland Trust Company, as trustee, any and all other papers or documents necessary or desirable more fully to convey to The Cleveland Trust Company, as trustee, the entire right, title and interest in and to the said Letters Patent and applications, when, and as, the same may be requested by The Cleveland Trust Company, as trustee, and to do any and all further acts which may be desir-

PRINTER'S NOTE:

The "Exhibit A," referred to above was not attached to Exhibit 38d.

able or necessary more effectually to secure to or vest in The Cleveland Trust Company, as trustee, its successors and assigns the entire right, title and interest in and to the said invention, Letters Patent and applications hereby sold, assigned and transferred or intended so to be.

- 4. The Parties of the First Part hereby agree for themselves, their respective executors and legal representatives, to assign to The Cleveland Trust Company, as trustee, without further consideration the entire right, title and interest in and to any United States Letters Patent or application relating to pistons per se which they may in the future acquire forthwith upon obtaining the same together with whatever rights they may acquire to sue and collect for past infringement thereof and to apply any damages and profits so recovered to the benefits of The Cleveland Trust Company, as Trustee.
- 5. In case the sub-license from the Aluminum Company of America to The National Piston Company, Incorporated, a copy of which is attached hereto, made a part hereof and marked "Exhibit B," is cancelled or terminated for any reason whatsoever, excepting the failure of The National Piston Company, Incorporated, reasonably to comply with its obligations thereunder, and said The National Piston Company, Incorporated, forthwith applies to whomsoever then holds or controls as owner or exclusive licensee, the inventions, applications for Letters Patent and Letters Patent embraced by such sub-license, for another sub-license upon terms at least as favorable for The National Piston Company, Incorporated, as those in said sub-license "B" contained. and such owner or exclusive licensee as the case might be, fails to execute or deliver to The National Piston Company, Incorporated, such a sub-license within thirty (30) days from the date of such application by said The National Piston Company, incorporated, then and in that event, this agreement shall be deemed and construed henceforth to operate as such a sub-license having the terms and conditions of the sub-license, Exhibit "B," applicable for such purpose and The National Piston Company, Incorporated, shall account thereunder directly to The Trust Company.

AF34

PRINTER'S NOTE:

The "Exhibit B" referred to above was not attached to Exhibit 38d.

6. This agreement, in the construction of which the laws of the State of Ohio shall govern, is made by the Trust Company under title conveyed by or acquired under and subject to the terms, provisions and conditions of said certain Conveyance, Declaration of Trust and Agreement, of which "Exhibit A" is a copy.

IN WITHESS WHIRROF the parties hereto have set their hands and affixed their seals this 11th day of April

1924.

THE NATIONAL PISTON COMPANY,
INCORPORATED,
HENRY MONKLEY,
President,
J. E. DIAMOND,
GUSTAVE E. FRANQUIST.

Attest:

J. E. DIAMOND,

Secolary.

Vice Pres.

THE CLEVELAND TRUST COMPANY,
R. A. MALM,
Vice-President.

Attest:

(Corporate Seal)

A. J. PERFLER,

Ass't Trust Officer.

Approved for Execution by The C. T. Co. R. T. S., Counsel.

STATE OF NEW YORK, COUNTY OF NEW YORK, SS.

On this 14th day of March, 1924, at New York City before me personally appeared Henry Monkley and James E. Diamond, to me known, who, being by me duly sworn, made oath that they are the president and easestery, Vice Pres. respectively, of The National Piston Company, Incorporated, the corporation described in and which executed the foregoing instrument, and are its agents for this purpose duly authorised, that they signed the same in behalf of said corporation, that the seal of fixed to said instrument is the seal of said corporation.

and was so affixed by authority of the Board of Directors; and they acknowledged the foregoing instrument to be their free act and deed and the free act and deed of said corporation.

Atenomo J. Janes,

(Notarial Seal)

Notary Public.

Notary Public, New York County New York Co. No. 87, Register No. 5065 Commission Expires March 30, 1925

STATE OF NEW YORK, COUNTY OF WATER, SA

On this 16th day of March, 1924, at Hochester, before me personally appeared Gustave E. Franquist, to me known, who being by me duly sworn made oath that he signed the foregoing instrument and he acknowledged the same to be his free act and deed.

> JAY B. Gma, Notary Public.

(Notarial Seal)

STATE OF NEW YORK, COUNTY OF NEW YORK, 28.

On this 14 day of March, 1924, at New York City, before me personally appeared James E. Diamond, to me known, who, being by me duly sworn, made oath that he signed the foregoing instrument and he acknowledged the same to be his free act and deed.

Atenomo J. James, Notary Public.

(Notarial Seal)

Notary Public, New York County New York Co. No. 87, Register No. 5065 Commission Expires March 30, 1925

STATE OF CHIO, COUPTY OF CUYAHOGA, M.

On this 11th day of March April, 1924, at Cleveland, Ohio, personally appeared before me R. A. Main and A. J. Perfler to me known to be respectively a vice-president and secretary Ass't Trust Officer of The Cleveland Trust Company, of Cleveland, Ohio, and acknowledged to me that they excented the foregoing instrument on behalf of said Company as Trustee, and for the uses and purposes therein set forth.

Box F. Hacourz, Notary Public.

PLAINTIPPS' EXHIBIT NO. 380.

License Agreement between Kant-Skore Piston Company and The Cleveland Trust Company, dated April 11, 1924.

(Filed January 27, 1934.)

Apr 11 1924

AGREEMENT

THIS AGREEMENT made and entered into this 11th day of March April, 1924, by and between The Karr-Skore Piston Company, an Ohio Corporation of Cincinnati, Ohio, (hereinafter sometimes referred to as Kant-Skore) and The Cleveland Trust Company of Cleveland, Ohio, a corporation of the State of Ohio, (hereinafter referred to as The Trust Company)

WITHESETH:

WHEREAS, Kant-Skore owns the entire right, title and interest in and to United States Letters Patent

Hater 1,485,078 . February 26, 1924.

and an application for United States Letters Patent, Serial No. 588,473, filed in the name of Hater.

WHEREAS, Kant-Skore desires, under certain conditions, to dispose of their interest in and to the said patents and in any other patents or applications for Letters Patent relating to pistons per se which they may own wholly or in part, or subsequently acquire, and

Whereas, The Trust Company desires to obtain the entire right, title and interest in and to the said patents and the entire right, title and interest possessed by Kantskore in and to any other patents or applications relating to pistons per se now owned or subsequently acquired by Kant-Skore together with certain rights to past infringements of the said patent or patents and application of applications.

Now, THEREFORE, in consideration of the covenants and agreements of the parties hereto, respectively as

Pistons per se means pistons whose patentability depends upon physical, structural characteristics of the piston and not upon the character of the material in the piston of the molds, machines or the processes by which the piston is made.

MARIT-BEOTE CA-CABVERGING AAMEL CO.

hereinafter set forth, said parties have covenanted and agreed, and do hereby covenant and agree with each other as follows:—

- 1. Kant-Skore agrees to sell, assign, transfer and sets over to and hereby sella, assigns, transfers and sets over to The Cleveland Trust Company as trustee of a certain beneficial interest created by a certain Conveyance, Declaration of Trust and Agreement dated March 7th, 1922, copy of which is attached, marked "Exhibit A," and another copy of which is on file with The Trust Company, the entire right, title and interest in and to United States Letters Patent, and applications enumerated above, and the entire right, title and interest possessed by Kant-Skore in and to any Letters Patent or applications for Letters Patent relating to pistons per se now owned, held, wholly or in part, on the date of the execution of this agreement or subsequently acquired; together with the right to sue for past infringements of the said patent or patents, or of any patent or patents issuing from such application or applications, and to collect damages and profits arising out of such infringement and apply the same to the benefit of The Cleveland Trust Company, as trustee. It is agreed that whatever right Kant-Skore now owns in or under the Spillman patent No. 1,325,176, December 16, 1919, is not transferred to The Trust Company by this agreement.
- 2. The Trust Company hereby agrees forthwith upon the execution of this agreement to issue in the name of and transfer to Kant-Skore fifty (50) shares in the beneficial interest created by and under said certain Conveyance, Declaration of Trust and Agreement, of which exhibit "A" is a copy.
- 3. Kant-Skore hereby agrees for itself, successors and its legal representatives to execute and deliver to The Cleveland Trust Company as Trustee any and all other papers or documents necessary or desirable more fully to convey to The Cleveland Trust Company, as Trustee, the entire right, title and interest in and to the said inventions, Letters Patent and applications and each of them hereby sold, assigned and transferred or intended so to be when, and as, the same may be requested

PRINTER'S NOTE:

The "Exhibit A" referred to above was not attached to Exhibit 38e.

by The Trust Company, as Trustee, its successors and

assigns.

4. Kant-Skore hereby agrees to assign to The Cleveland Trust Company, as Trustee, without further consideration, the entire right, title and interest in and to any United States Letters Patent or application relating to pistons per se which it may in the lature acquire forthwith upon obtaining the same together with whatever rights they may acquire to sue and collect for past infringement thereof and to apply any damages and profits so recovered to the benefit of The Cleveland Trust Com-

pany as trustee.

5. In case the sub-license from the Aluminum Company of America to the Kant-Skore Company, a copy of which is attached hereto, made a part hereof, and marked "Exhibit B," is cancelled or terminated for any reason whatsoever, excepting the failure of Kant-Skore Company reasonably to comply with its obligations thereunder, and said Kant-Skore Company forthwith applies to whomsoever then holds or controls as owner or exclusive licensee, the inventions, applications for Letters Patent and Letters Patent embraced by such sub-license, for another sub-license upon terms at least as favorable for Kant-Skore Company as those in said sub-license "B" contained, and such owner or exclusive licensee as the case might be, fails to execute or deliver to Kant-Skore Company such a sub-license within thirty (30) days from the date of such application by said Kant-Skore Company, then and in that event, this agreement shall be deemed and construed henceforth to operate as such a sub-license having the terms and conditions of the sub-license, Exhibit "B," applicable for such purpose and Kant-Skore Company shall account thereunder directly to The Trust Company.

6. This agreement, in the construction of which the laws of the State of Ohio shall govern, is made by The Trust Company under title conveyed by or acquired under and subject to the terms, provisions and conditions of said certain Conveyance, Declaration of Trust and Agreement, of which exhibit "A" is a copy.

PRINTER'S NOTE:

The "Exhibit B" referred to above was not attached to Exhibit 38e.

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In Wirsnes Whannor the parties hereto have set their hand and affixed their seal this 11th day of April, 1924.

THE CLEVELAND TRUST COMPANY, By R. A. Malse,

Vice President.

Attest:

A. J. PREFLEE,
Ass't Trust Officer.

THE KANT-SKORE PISTON COMPANT, By H. J. HATER, V. P.

Attest:

R. T. MESKER, Secv.

STATE OF OHIO, CUYAHOGA COUNTY, 88:

On the 11th day of April, 1924, personally appeared before me, R. A. Malm and A. J. Perfier to me known to be respectively the vice president and secretary Ass't Trust Officer of The Cleveland Trust Company, of Cleveland, Ohio, and acknowledged to me that they executed the foregoing instrument on behalf of said company and for the uses and purposes set forth.

BOY F. HAGGETT,

(Notarial Seal)

Notary Public.

STATE OF OHIO, COUNTY OF HAMILTON, 68:

On the 10th day of March, 1924, personally appeared before me H. J. Hater, and R. T. Mesker, to me known to be respectively the president and secretary of The Kant-Skore Piston Company, and acknowledged to me that they executed the foregoing instrument on behalf-of said company and for the uses and purposes therein set forth.

(Notarial Seal)

DAVID LORBACH, Notary Public.

PLAINTIFFS' EXHIBIT NO. 39a.

Letter from Aluminum Company of America to The Cleveland Trust Company, dated September 19, 1927.

(Filed January 27, 1934.)

Cleveland, Ohio, September 19, 1927.

The Cleveland Trust Company,

Trustee under Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922, Cleveland, Ohio.

Gentlemen:

We hereby consent to your executing and carrying out the agreement dated October 12th, 1927, between The Cleveland Trust Company, Trustee, and Bohn Aluminum & Brass Corporation, which has been initialled by Mr. W. P. King, and the license agreement dated as of Oct. 12th as of Sept. 15th, 1927, between The Cleveland Trust Company, Trustee, as Licensor and Bohn Aluminum & Brass Corporation as Licensee, which has also been initialled by Mr. W. P. King, -it being understood that said license agreement is to be carried out according to the terms thereof and is not to be changed or modified without our consent; and provided that either the agreements between The Cleveland Trust Company and Walker M. Levett Company, et al., and The National Piston Company et al., respectively, each dated April 11, 1924, shall be surrendered and cancelled, or all rights under paragraph four of the former agreement and paragraph five of the latter agreement be waived and extinguished.

This letter of consent or authority to execute shall continue unless extended for a further period at that

time, until thirty days from date hereof.

Very truly yours,

ALUMINUM COMPANY OF AMERICA, By W. P. King, Vice-President.

PLAINTIFFS' EXHIBIT NO. 39b.

Letter from Aluminum Company of America to The Cleveland Trust Company, dated October 12, 1927.

(Filed January 27, 1934.)

Detroit, Mich., October 12, 1927.

The Cleveland Trust Company,
Trustee under Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922. Cleveland, Ohio.

Gentlemen:

Supplementing our letter of September 19, 1927 to you, we beg to say that it is understood and we hereby agree, that in case we surrender the license heretofore granted to us by you under date of April 26, 1924, any re-assignment of the patents, patent applications or other patent rights which have been assigned by us to you under said license agreement, shall be made subject to the license granted by you to the Bohn Aluminum & Brass Corporation by the agreement dated executed this day 1927 between you and the Bohn Aluminum & Brass Corporation, the execution of which on your part we consented to in our letter of September 19th, 1927.

Very truly,

ALUMINUM COMPANY OF AMERICA, By W. P. King, Vice President.

THE MANAGEMENT AND ASSESSMENT OF THE ASSESSMENT

PLAINTIFFS' EXHIBIT NO. 39c.

License Agreement between The Cleveland Trust Company and Bohn Aluminum & Brass Corporation, dated September 15, 1927, with Lists A and B Attached.

(Filed January 27, 1934.)

LICENSE AGREEMENT

This License Agreement, made and entered into by and between The Cleveland Trust Company, of Cleveland, Ohio, as Trustee under the Declaration of Trust and Agreement between L. P. Mooers et al. and The Cleveland Trust Company, dated March 7, 1922, hereinafter sometimes called the Licensor, and Bohn Aluminum & Brass Corporation, a Michigan corporation of Detroit, Michigan, hereinafter sometimes called the Licensee, witnesseth:—

Whereas the Licensor owns the entire right, title and interest in and to the Letters Patent and applications for Letters Patent in the United States as set forth in List A, attached hereto, and has arranged to acquire the entire right, title and interest in and to the Letters Patent and applications set forth in List B, attached hereto; and

WHEREAS the Licensor may acquire other United States patents, patent applications and patent rights relating to pistons per se during the life of this agreement; and

Whereas the said Licensee is desirous of acquiring a license to make, use and sell the inventions included in the said patents and applications acquired and to be acquired by the Licensor for the full term for which said patents are or shall be granted;

Now, Therefore, in consideration of the premises and of the covenants and agreements of the parties here to, respectively, as hereinafter set forth, said parties have covenanted and agreed, and do hereby covenant and agree with each other as follows:

Pistons per se means pistons whose patentability de pends upon physical, structural characteristics of the piston and not upon the character of the material in the piston of the molds, machines or the processes by which the piston is made.

Amended-January 1, 1928

The Licensor grants the Licensee the non-exclusive right to make, use and sell a maximum of five million (5,000,000) pistons and/or piston castings per accounting year (each year beginning July 1st) embodying any of the inventions covered by any of the patents and applications in the above named lists, being all of the patents and applications for patents relating to pistons per se now owned by the Licensor, or to be covered by any continuations and divisions, renewals or reissues of the same, for the full term of each of said patents throughout the United States, the territories and possessions thereof. In case the Licensee makes and sells no socalled controlled type* pistons or eastings which are, after sale, modified or to be modified into controlled type pistons, during any accounting year, the maximum of five million pistons and/or piston castings provided herein for that year is waived and the number of pistons and/or piston castings the licensee may make hereunder for that year is unlimited. This license and agreement will be automatically extended to cover any other and further patents or applications or other rights under patents which the Licensor may acquire relating to pistons per se, subject to the conditions imposed thereon when received by the Licensor, unless excluded therefrom by the Licensee as hereinafter provided, and the Licensor agrees to execute any further instruments and perform any further acts if any are required, to consummate the granting of such licenses to the Licensee.

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The Licensor releases and discharges the Licensee, all its vendees and/or users of pistons, the castings for which were heretofore acquired from the Licensee, from any and all claims whatsoever for damages or profits by reason of any alleged past infringement of any of the patents in lists A and B hereto attached now owned by the Licensor and arising out of the manufacture, use and

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By controlled type of eluminum piston is meant any piston made in any part of a light metal or of an alloy of a specific gravity less than iron or steel, the expansion and contraction of which is controlled to any extent by any other metal with a coefficient of expansion different from that of the said light metal or alloy.

sale of such pistons; and from any claim or claims for past damages or profits under patents which shall be acquired by the Licensor in the future, during the continuance of this agreement, and under which the Licensee shall accept a license hereunder, and theretofore arising out of the manufacture, use and sale of such pistons; and agrees not to institute or to aid or abet the institution of any suit against the Licensee, or the vendees or users of pistons, the castings for which were heretofore acquired from the Licensee, for any alleged past infringement of any patents relating to the subjects covered by the patents or applications named herein or for damages and profits because of alleged past infringement thereof and heretofore arising out of the manufacture, use and sale of such pistons.

Ш

- 1. (a) The Licensor shall institute and prosecute to a conclusion with due diligence suit or suits against any or all infringers of the patents included within the terms of this agreement necessary reasonably to protect the interests of the Licensee acquired hereunder, provided that the Licensor be indemnified to its satisfaction by the Licensee for any costs or expenses which the Licensor may suffer or sustain in connection with or growing out of any such suit.
- (b) The Licensor shall defend any suit or suits, so far as such defense shall be necessary reasonably to protect the interests of the Licensee acquired hereunder, brought because of the alleged infringement of any Letters Patent covering the design of pistons made, sold or used under this agreement and for which royalties are paid under this agreement, provided that the Licensor be indemnified to its satisfaction by the Licensee for any costs or expenses which the Licensor may suffer or sustain in connection with or growing out of any such defense.
- 2. Should the Licensor bring and prosecute or defend as above provided such infringement suit or suits at its own expense, all profits or damages recovered in said suit or suits shall be the absolute property of the Licensor.
- 3. In the event of the failure of the Licensor promptly to institute and vigorously prosecute or to defend such suit or suits as may be necessary reasonably to protect the interests of the Licensee hereunder, then and in that event, the Licensee having reasonably in-

demnified the Licensor, may in the name of the Licensor or the names of the Licensor and Licensee jointly institute or adopt and diligently prosecute or defend at the Licensee's expense such suit or suits as may be required reasonably to protect its interests. The Licensor at any time shall have the right to join in the prosecution or defense of such suit or suits with its own counsel and at its own expense.

4. Should the Licensee bring or prosecute or defend as above provided any such infringement suit or suits or should the Licensee furnish indemnification to the Licensor in connection with suits brought or prosecuted or defended by the Licensor and pay any sum on account of such indemnification, it shall have the right to apply all revalties payable by it on the reasonable costs and expenses of such suit or suits, including attorney's fees, or on said sum paid on account of indemnification and shall apply the sum, if any, recovered in any such suit, first, to the reimbursement of it for said reasonable expenses and costs, including attorney's fees, or sums paid on account of indemnification, and not theretofore reimbursed to it out of royalties, and second, to the payment to the Licensor of all sums theretofore deducted by the Licensee from royalties and applied to the said reasonable costs and expenses, including attorney's fees, of such suit or payments of indemnification, and the balance shall be the absolute property of the Licensee.

IV

The Licensee agrees that it will within the months of January, April, July and October of each year from and after the execution hereof, furnish to the Licensor, its successors or assigns in interest, a written statement under oath which shall show:—

(a) the number of pistons and piston castings made by or for it or imported by it, and used, sold or otherwise disposed of by it during the preceding three calendar months, which contain or which to the Licensee's knowledge are to be modified or fabricated by the Licensee's vendees to contain and embody any invention covered by any of the claims of any of the Letters Patent and applications recited in Lists A and B hereto attached, or in the future acquired by the Licensor and included herein.

^{*}Sold in this contract means and includes only licensed pistons which are delivered during the period.

This report shall be made whether or not the Licensee makes, uses or sells any pistons and/or castings therefor during the preceding royalty pe-

riod. (b) the number of controlled type pistons and castings for controlled type pistons made by or for it or imported by it, and used, sold or otherwise disposed of by it during the preceding three calendar

This report shall be made whether or not the Limonths censee makes, uses or sells any controlled type pistons and/or castings therefor during the preceding

royalty period.

(c) the number of such pistons and piston castings sold by the Licensee and for which the vendee has been subsequently credited.

The first report shall include the pistons and/or piston castings covered by this Article, used, sold or otherwise disposed of between the date of this contract September fifteenth and October 1, 1927.

Alteration (OK)

B. A. & B. Corpn.
The C. T. Co.—AJP
A. Co. of Am.—WPK

The Licensee will pay the Licensor a royalty of one cent (1¢) upon each piston used, sold or otherwise disposed of by the Licensee during the life of this agreement, embodying in its construction any invention covered by one or more of the claims of the Letters P and applications named in Lists A and B attached he to, or in the future acquired by the Licensor and added hereto, and upon each piston casting sold or otherwise disposed of by the Licensee with the intention or the knowledge of the Licensee that it shall be modified of fabricated by the Licensee's vendee in such way as the construction. embody in its construction any invention covered by one or more of the claims in the said Letters Patent or applications.

It is understood that no royalties will be payable or collectible upon the licensed pistons or piston e which have been sold and for which the vendee there has been subsequently credited, and that if any royalti have been paid upon the licensed pistons or piston castings which are sold, and for which the vendee has been subsequently credited, the Licensee shall have credit therefor upon the next due payment.

Q VI

For the purpose of the interpretation of the provisions of this agreement, it is agreed that the commercial controlled type pistons heretofore manufactured, or for which castings have heretofore been manufactured, by Bohn Corporation and Aluminum Company of America, are covered by claims of the patents included in Lists A and B hereto attached.

VII

Within thirty (30) days after it shall have furnished, in January, April, July and October of each year, the statements specified in Article IV hereof, the Licensee shall and will pay to the Licensor, its successors or the assigns of its interest in said Letters Patent, the royalties upon the pistons and piston castings covered by said reports, at the rate prescribed.

VIII

The Licensee agrees that it will keep accurate books of account, giving full particulars of the Licensee's business with respect to the licensed pistons and piston castings covered by this agreement and will admit the Licensor or its duly accredited agent at all reasonable times to inspect the same.

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In the event that the combination set forth in any of the claims of the Letters Patent shown in Lists A and B hereto attached or of the applications for Letters Patent shown in said lists A and B and of the Letters Patent to be granted on said applications, and/or acquired in the future and added hereto, is held by a court of final jurisdiction or by an inferior court from whose decree no appeal is taken or the appeal is denied or dismissed, to be an infringement of any other patent (other than patents owned by the Licensee or under which the Licensee is licensed) in any patent suit brought in the United States against the Licensee, any sub-licensees or any other of the Licensee's licensees, any sub-licensees or any of its or their vendees, the Licensee shall have, and is hereby given, the right and option to exclude from this license

any such claim or claims or the Letters Patent or applications for Letters Patent containing such claim or claims, as the case may be, and to have the royalty payable hereunder reduced proportionately to the reduction, if any, caused by such judicial holdings, in the value of the patents and applications comprehended by this agreement, such proportion to be determined by arbitration as bereinafter in Paragraph XVIII hereof provided, or to terminate this agreement altogether, by giving to the Licensor notice in writing of its election so to do within six (6) months from the rendition of the judicial holding of the court of final jurisdiction or after the expiration of the time for appeal or after the appeal has been denied or dismissed.

X

This agreement and license shall be transferable only to the successors or assigns of the entire casting business of the Licensee or the entire business of either of the parties hereto, but in that event the successors or assigns shall be bound by the provisions of this agreement and obligated to conform thereto; provided, however, that any successor to The Cleveland Trust Company, as Trustee under said Declaration of Trust and Agreement, dated March 7, 1922, shall be deemed, for the purposes hereof, to be the successor and assign of the entire business of the Licensor.

XI

The Licensee will not during the life of this agreement contest, or aid others in contesting, the scope or validity of any of the Letters Patent included within this agreement or afterwards acquired by the Licensor and included in this agreement.

XII

The Licensee hereby is given the right and option to exclude from this license any Letters Patent or applications for Letters Patent or other patent rights which the Licensor may acquire after the execution of this license, provided the Licensee gives the Licensor notice in writing of such exclusion within ninety (90) days after notice in writing to the Licensee by the Licensor of the acquisition of such Letters Patent or applications of other patent rights.

XIII

The Licensee shall pay royalties only upon pistons and piston eastings delivered during the term of this license.

XIV

If either of the parties hereto neglects or refuses to keep any of its covenants herein, then the other party hereto may serve on the derelict party by registered mail a notice in writing of such default and if the derelict party shall continue such default for thirty (30) days after the serving of such notice, then the aggrieved party may at its option cancel this license by a notice in writing of such cancellation and termination, provided, however, that the foregoing remedy shall not exclude any other remedy which the aggrieved party may have at law or in equity. The waiver of any breach by either party shall not be interpreted as constituting a waiver of any further breach or breaches.

XV

The Licensor hereby grants to the Licensee the right to make, use and sell in the United States pistons embodying the inventions covered by any foreign patents or applications for foreign patents, which the Licensor now owns or controls, or in the future acquires, for sale and use in foreign countries covered by said patents and/or applications. The Licensor releases the Licensee, its vendees and all users of its pistons, from any claim or claims for alleged infringement of foreign patents, which the Licensor now has or in the future may acquire and under which the Licensee may accept a license as herein provided. The Licensor agrees, upon demand of the Licensee, to execute all instruments and perform all acts necessary to grant the licenses under this paragraph. This license and agreement will be automatically extended to cover pistons under any other and further foreign patents or applications for foreign patents or other rights under foreign patents on pistons per se which the Licensor may acquire in the future, unless excluded therefrom by the Licensee as provided for in this contract and the Licensor agrees to execute any fur-ther instruments and perform any further acts, if any are required, to consummate the granting of licenses to the Licensee under this section of this agreement.

XVI

The Licensee shall use reasonable diligence in manufacturing and/or marketing pistons embodying inventions, licensed hereunder, and, in the event that, during the continuance of this agreement, it should not do so the Licensor shall have the following right, option and privilege exercisable by it forthwith upon the finding by arbitration as hereinafter provided that the Licensee has not used and is not using such diligence:

(a) To cancel or terminate this agreement by giving six (6) months' notice in writing to the said Licensee of its desire and intentions so to do; where upon at the expiration of said six (6) months from the date of said notice this agreement shall be terminated.

XVII

Should the Licensee, taking advantage of its privilege under any of the provisions of this contract, elect to terminate this contract and stand out from under the same, the Licensee shall not be estopped to deny the validity of any of the patents covered or comprehended by this contract and shall not be deprived of any of the defenses or the rights of a defendant in an ordinary patent infringement suit, but, on the contrary, shall stand in the position of one who had never entered into this contract.

XVIII

In the event either party hereto calls for an arbitr tion as provided for in this contract, each party select an arbitrator and the two arbitrators shall a third arbitrator. In the event that the two art tors fail to select a third or in the event with fails to select its arbitrator it is agreed that the and/or second arbitrator may be selected by the d judge of the United States District Court, Norther trict of Ohio, Eastern Division, who has the n been est in said office. The three arbitrators thu shall constitute the Board of Arbitration and t ties hereto shall submit their contentions to this of Arbitration at a time and in a manner de by the arbitrators. The decision of any two ark shall be final and binding on the parties hereto party shall bear the expense of its arbitrator a shall bear the expense of the third arbitrator share share alike.

XIX

The Licensor agrees that should it at any time during the life of this agreement grant licenses under the patents, now included, or in the future included, in this agreement, or under the substantial and material patents now included or to be included in this agreement, at lower rates than one cent (£01) per piston as provided for herein, or otherwise upon more favorable terms than are provided for herein, then, upon request of Licensee, this agreement shall be medified to make its terms as favorable as those upon which any such subsequent license may be granted.

XX

Amended-January 1, 1928

Except as otherwise provided in Article I hereof, this licensee is limited to five million (5,000,000) pistons and piston castings together) per accounting year. If the Licensee exactis that amount in any accounting year without the written consent of the Licensor, and of the Licensor's other licensee (being the exclusive licensee except for this license) under the patents held in the Licensor's trust estate, then the Licensor shall charge and collect an additional royalty of ten cents (10¢) per piston for all pistons and piston castings in excess of the maximum five million (5,000,000), which additional royalty shall be paid by the Licensee to the Licensor on demand, and the Licensor shall diligently proceed by proper proceedings to enjoin and prevent any further such violation of the provisions of this license, or, failing so to enjoin and prevent such violation, the Licensor shall cancel this license.

XXI

This agreement is made by the Licensor under title conveyed by or acquired under and subject to the terms, provisions and conditions of a certain Conveyance, Declaration of Trust and Agreement entered into as of the 7th day of March, 1922, by and between Louis P. Mocers and George B. Pitts and The Clovesand Trust Company, Trustee, the Licensor herein, a copy of which is on file at the principal office of said The Cloveland Trust Company in the City of Cleveland, and open to the inspection of the Licenson, and unless terminated as hereinbefore, provided, shall terminate with the date of expiration of the last Letters Patent now or hereafter embraced in said Declaration of Trust and Agreement.

XXII

Upon the execution and delivery hereof, Bohn Corporation shall surrender and cancel all of the Sub-licenses under the patents held by the Trust Company which said Bohn Corporation or any of its subsidiary or affiliated companies own.

XXIII

The non-exclusive license granted by this agreement does not convey to the Licensee any rights to grant any sub-licenses thereunder.

IN WITNESS WHEREOF, the parties hereto have caused this instrument to be executed in duplicate by their respective officers thereunto duly authorized October 12, 1923 as of the 15th day of September, A. D. 1927.

BOHN ALUMINUM & BRASS CORPORATION, By P. A. MARKEY,

Vice-President,

R. T. G.

A. P. LAUER,

Secretary.
(Corporate Seal)

THE CLEVELAND TRUST COMPANY, TRUSTEE, By R. A. Malm,

Vice-President,

A. J. PERFLER,
Assistant Trust Officer.

(Corporate Seal)

Approved for Execution by The C. T. Co.

**R. T. S., Counsel.

STATE OF OHIG, COUNTY OF CUYAHOGA, 88.:

On the 11th day of October, 1927, personally appeared before me R. A. Malm and A. J. Perrine, to me known to be, respectively, the Vice-President and Assistant Trust Officer of The Cleveland Trust Company, and acknowledged to me that they executed the foregoing instrument on behalf of said Trust Company, as Trustes, and for the uses and purposes therein set forth.

ELMER L. HAHN, Notary Public. STATE OF MICHIGAN, COUNTY OF WAYNE, 88.:

On the 12th day of October, 1927, personally appeared before me P. A. MARKEY and A. P. LAUER, to me known to be, respectively, the Vice-President and Secretary of the Bohn Aluminum & Brass Corporation, and acknowledged to me that they executed the foregoing instrument on behalf of said company and for the uses and purposes therein set forth.

F. MILFORD TAYLOR,

Notary Public.

My Commission Expires Mar. 21, 1930.

LIST A

Patent Number	Ratentee	Date
		Feb. 23, 1926
Re . 16,273	B. M. Howdeshell	Apr. 14, 1914
1,092,870	Spillman & Mooers	Sept. 21, 1915
1,153,902	G. E. Franquist	Sept. 17, 1918
1,279,184	J. G. Vincent	
1,293,846	H. C. Marmon	Feb. 11, 1919
1,327,147	H. D. Church	Jan. 6, 1920
1,371,320	C. A. Marien	Mar. 15, 1921
1,347,819	L. P. Mooers	July 27, 1920
1,388,279	C. A. Marien	Aug. 23, 1921
1,402,308	L. P. Mooers	Jan. 3, 1922
1,402,309	L. P. Mooers	Jan. 3, 1922
	W. B. & M. Berry	Feb. 28, 1922
1,408,066	R. M. Howdeshell	Nov. 6, 1923
1,473,233	W. G. Berry, et al.	Aug. 25, 1925
1,551,233		Nov. 24, 1925
1,563,025	H. J. Hater	
Serial No.	Applicant	Filing Date
563,782	Gustave E. Franquist	May 26, 1922
	Stephen D. Hartog	Feb. 16, 1926
88,706	Dichion D	4 0 1000

563,782 Gustave E. Fran	
	tos
88,706 Stephen D. Har	- 6
100,496 Harold J. Ness	
100,497 Harold J. Ness	
133,909 William C. McC	oy
143,878 William C. McC	оу
143,879 William C. McC	
	to
467,587 Stephen D. Har	

561,997 649,481 204,661

James E. Diamond Louis P. Mooers Edward J. Gulick

Fili	ng D	ale /
May	26,	1922
Feb. Apr.	16,	
Apr.	8,	1926
Sep.		1926 1926
Oct.	25,	1926
May	7, 18,	1921
Ren	ewec	ALCOHOLD SALES
Sep.	-	The same of the same
July	5,	1923
Nov	. 30	1311

			-
9 P	82	-0	- 74

Inventor	Patent Number	Date
Wasson	1,320,188	10-28-19
Napier	1,403,560	1-17-22
Parkhurst	1,440,549	1- 2-23
Wills	1,441,468	1- 9-23
Pomeroy	1,499,073	6-24-24
Napier	1,525,316	2- 3-25
Jardine	1,563,194	11-24-25
Jardine & Jehle	1,580,491	4-13-26

Applicant	Serial Number	Filing Date
Jardine	450,898	3- 9-21
Jehle & Jardine	544,487	3-17-22
Jardine & Jehle	615,324	1-27-23
Welty	39,676	6-26-25
Jardine	47,214	7-31-25
Welty	47.220	7-31-25
Jardine	47,234	7-31-25
Norton	51,748	8-22-25
Jardine .	57,838	9-22-25
Jardine°	79,527	1- 6-26
Jardine & Cooper	79,651	1- 6-26
Jardine & Cooper	79,800	1- 7-26
Welty	80,173	1- 9-26
Norton	80,902	1-13-26
Evans Jardine	84,894	1-30-26
	100,771	4- 9-26
Jardine Tardine	100,772	4- 9-26
Jardine	-100,773	4- 9-26
Jardine	100,774	4- 9-26
Welty.	128,764	8-12-26
Jardine .	137,194	9-23-26
Jardine & Cooper	174,202	3-10-27
Norton	Docket No. 2799 bei	ng prepared
Welty	Docket No. 2834 bei	ng prepared.

PLAINTIFFS' EXHIBIT NO. 39d.

Letter from Aluminum Company of America to The Cleveland Trust Company, dated September 19, 1927.

(Filed-January 27, 1934.)

ALUMINUM COMPANY OF AMERICA

Warren P. King Vice-President

Cleveland, O., September 19, 1927.

The Cleveland Trust Company, Trustee under Declaration of Trust between L. P. Mooers et al., dated March 7, 1922,

Cleveland, Ohio.

Gentlemen:

We beg to advise that we recognize that the commercial controlled type pistons heretofore manufactured, or for which castings have heretofore been manufactured, by us, are covered by claims of one or more of the patents included in lists A and/or B attached hereto.

Very truly yours,

ALUMINUM COMPANY OF AMERICA, By W. P. King,

P:L

Vice-President.

PRINTER'S NOTE:

Lists A and B, attached to the original hereof, having been printed as part of Flaintiffs' Exhibit No. 39c, supra, have been omitted at this point to comply with the rule against duplication.

PLAINTIFFS' EXHIBIT NO. 39e.

Letter from Aluminum Company of America to The Cleveland Trust Company, dated April 26, 1928.

(Filed January 27, 1934.)

Cleveland, Ohio, April 26, 1928.

The Cleveland Trust Company,
Trustee under Declaration of Trust and Agreement between L. P. Movers et al., dated March 7, 1922, Cleveland, Ohio.

Gentlemen:

We hereby consent to your executing the Amendment to the License Agreement between The Cleveland Trust Company, Trustee, Licensor, and Bohn Aluminum and Brass Corporation, Licensee, dated as of January 1, 1928, but made April 25, 1928, which has been signed by the officers of Bohn Aluminum and Brass Corporation and acknowledged by them under date of April 14, 1928, it being understood that he License Agreement executed on October 12, 1927, as of September 15, 1927, between The Cleveland Trust Company, Trustee, as Licensor, and Bohn Aluminum and Brass Corporation as Licensee, as amended by the said Amendment thereto hereinabove mentioned, is to be carried out according to the terms thereof and is not to be further changed or modified without our consent.

Very truly yours,

ALUMINUM COMPANY OF AMERICA, By W. P. KING, Vice-President.

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P:L

PLAINTIFFS' EXHIBIT NO. 39f.

(Defendants' Exhibit &U.)

License Agreement between The Cleveland Trust Company and Bohn Aluminum & Brass Corporation.

(Filed January 27, 1934.)

LICENSE AGREEMENT
THE CEVELAND TRUST COMPANY

BOHN ALUMINUM AND BRASS CORPORATION October 12, 1927

Amended—Jan. 1, 1928 Amended—Dec. 24-1929

This Agreement, made and entered into ae of on the 25th day of April, 1928, as of the first day of January 1928 by and between The Cleveland Trust Company, of Cleveland, Ohio, as Trustee under the Declaration of Trust and Agreement between L. P. Mooers et al. and The Cleveland Trust Company, dated March 7, 1922, hereinafter sometimes called the "Licensor," and Bohn Aluminum and Brass Corporation, a Michigan corporation, of Detroit, Michigan, hereinafter sometimes called the "Licensee,"

WITNESSETH:

Whereas said The Cleveland Trust Company, as Trustee as aforesaid, and the Bohn Aluminum and Brass Corporation heretofore entered into a certain License Agreement, executed on the 12th day of October, 1927, as of the 15th day of September, 1927, wherein said Trust Company, as said Trustee, is Licensor and the Bohn Aluminum and Brass Corporation is Licensee; and

WHEREAS the parties thereto desire to modify and amend said License Agreement as hereinafter provided;

Now, Therefore, it is agreed by and between the parties hereto,—each party hereto making its promises and agreements herein contained in consideration of the promises and agreements of the other party herein contained,—as follows, to wit:

1. The first two sentences of Article I of the said License Agreement, executed October 12, 1927, as of September 15, 1927, are hereby modified and amended so as to read as follows:

The Licensor grants the Licensee the non-exclusive right to make, use and sell a maximum of ten million (10,000,000) pistons and/or piston castings per accounting year (each year beginning January 1st) embodying any of the inventions covered by any of the patents and applications in the above named lists, being all of the patents and applications for. patents relating to pistons per se now owned by the Licensor, or to be covered by any continuations and divisions, renewals or reissues of the same, for the full term of each of said patents throughout the United States, the territories and possessions thereof. In case the Licensee makes and sells no so-called controlled type pistons or castings which are, after sale, modified or to be modified into controlled type pistons, during any accounting year, the maximum of ten million pistons and/or piston castings provided herein for that year is waived and the number of pistons and/or piston castings the licensee may make hereunder for that year is unlimited.

2. Article XX of the said License Agreement, executed October 12, 1927, as of S. otember 15, 1927, is hereby modified and amended so as to read as follows:

Except as otherwise provided in Article I hereof, this license is limited to ten million (10,000,000)
pistons and piston castings (together) per accounting year. If the Licensee exceeds that amount in any
accounting year without the written consent of the
Licensor, and of the Licensor's other licensee (being
the exclusive licensee except for this license) under
the patents held in the Licensor's trust estate, then
the Licensor shall charge and collect an additional
royalty of ten cents (10¢) per piston for all pistons
and piston castings in excess of the maximum ten
million (10,000,000), which additional royalty shall
be paid by the Licensee to the Licensor on demand,
and the Licensor shall diligently proceed by proper
proceedings to enjoin and prevent any further such
violation of the provisions of this license, or, failing

By controlled type of aluminum piston is meant any piston made in any part of a light metal or of an alloy of a specific gravity less than iron or steel, the expansion and contraction of which is controlled to any extent by any other metal with a coefficient of expansion different from that of the said light metal or alloy.

so to enjoin and prevent such violation, the Licensor shall cancel this license.

3. Except as hereinabove otherwise specifically provided, the said agreement executed October 12, 1927, as of September 15, 1927, shall remain unchanged and in full force and effect.

In Witness Whereof, the parties hereto have caused this instrument to be executed in duplicate by their respective officers thereunto duly authorized as of the day and year first above written.

BOHN ALUMINUM AND BRASS CORPORATION,
By P. A. MARKEY,
Vice-President.

S. D. DEN UYL,
Ass't Secretary.

THE CLEVELAND TRUST COMPANY, Trustee, By R. A. Malm, Vice-President.

A. J. Perfler,
Assistant Trust Officer.

Approved for execution by the C. T. Co.
A. J. P., Ass't Counsel.

STATE OF OHIO
COUNTY OF CUYAHOGA

On the 25th day of April, 1928, personally appeared before me R. A. Malm and A. J. Perfler, to me known to be, respectively, the Vice-President and Assistant Trust Officer of The Cleveland Trust Company, and acknowledged to me that they executed the foregoing instrument on behalf of said Trust Company, as Trustee, and for the uses and purposes therein set forth.

ELMER L. HAHN, Notary Public.

(Notarial Seal)

My commission expires August 5th, 1930.

STATE OF MICHIGAN SECOUNTY OF WAYNE

On the 14th day of April, 1928, personally appeared before me P. A. MARKEY and S. D. DEN UYL, to me known to be, respectively, the Vice-President and Ass't Secretary of the Bohn Aluminum and Brass Corporation, and acknowledged to me that they executed the foregoing instrument on behalf of said Company and for the uses and purposes therein set forth.

Familiono Taylon,
Notary Public.

(Notarial Seal)

My commission expires Mar. 21, 1930.

PLAINTIFFS' EXHIBIT NO. 39g.

Letter from Aluminum Company of America to The Cleveland Trust Company, dated December 24, 1929.

(Filed January 27, 1934.)

Cleveland, Ohio, December 24, 1929.

The Cleveland Trust Company, Trustee under Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922, Cleveland, Ohio.

Gentlemen:

We hereby consent to your licensing Bohn Aluminum & Brass Corporation to make, use and sell a maximum of Eleven Million (11,000,000) pistons and/or piston castings during the accounting year beginning January 1, 1929, and ending December 31, 1929, under the License Agreement dated September 15, 1927, and actually executed October 12, 1927, between you as Licensor and Bohn Aluminum and Brass Corporation as Licensee, as amended by Agreement made on April 25, 1928, as of January 1, 1928, (being One Million (1,000,000) pistons and/or piston castings more than provided in said Agreement as so amended), it being understood that all other terms and provisions of said License Agreement as amended on April 25, 1928, shall be and remain in full force and effect and that the said One Million (1,000,000) increase in the number of licensed pistons and/or piston castings applies to said accounting year 1929 only, and that the maximum number of licensed pistons and/or piston castings for each accounting year subsequent to the said accounting year 1929 shall be Ten Million (10,000,-000), and that the said license Agreement executed on October 12, 1927, as of September 15, 1927, between you as Licensor and Bohn Aluminum & Brass Corporation as Licensee, as amended by the said Agreement made April 25, 1928, as of January 1, 1928, except as to the said increase of One Million (1,000,000) in the number of pistons and/or piston castings licensed for the year 1929, is to be carried out according to the terms thereof and is not to be further changed or modified without our consent.

Very truly yours,

ALUMINUM COMPANY OF AMERICA, By W. P. King,

Vice-President.

PLAINTIFFS' EXHIBIT NO. 40.

Agreement between Bohn Aluminum & Brass Corporation and The Cleveland Trust Company, dated October 12, 1927, Under Schmiedeknecht Patent No. 1,256,265.

[Offered also as Defendants' Exhibit 4-V.] (Filed September 27, 1934.)

AGREEMENT

This Agreement made and entered into this 12th day of October, 1927, by and between the Bohn Aluminum & Brass Corporation, a Michigan corporation, of Detroit, Michigan, hereinafter sometimes called the "Bohn Corporation," and The Cleveland Trust Company, an Ohio corporation, of Cleveland, Ohio, as Trustee under the Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922, hereinafter sometimes called the "Trust Company,"

WITNESSETH !

Whereas the Bohn Aluminum & Brass Corporation owns the entire right, title and interest in and to United States Letters Patent No. 1,256,265, issued to Victor E. Schmiedeknecht on February 12, 1918, and an application for United States Letters Patent, Serial No. 201650, filed in the name of Frank J. Kent, both of which are for certain inventions relating to pistons per se*; and

Whereas the Bohn Corporation is a large manufacturer of aluminum pistons; and

Whereas the Trust Company, as Trustee as aforesaid, owns various patents relating to pistons per se; and

Whenes the Trust Company, as Trustee as aforesaid, desires to obtain the patent and the application for patent above named and to have the said Bohn Corporation accept a license under the patents in said trust estate, relating to pistons per se, by the terms of which said Bohn Corporation recognizes said patents and agrees to pay one cent (1¢) per piston royalty upon the pistons and/or castings therefor, made, used and/or sold by it, which are covered by said patents, or any of them; and

Pistons per se means pistons whose patentability depends upon physical, structural characteristics of the piston and not upon the character of the material in the piston or the molds, machines or the processes by which the piston is made.

Whereas said Bohn Corporation is willing to sell and assign to said Trust Company, as Trustee as aforesaid, the patent and the application for patent above named and to accept a license from said Trust Company upon the terms and conditions hereinafter provided for;

Now, THEREFORE, it is agreed by and between the parties hereto, each party hereto making its promises and agreements herein contained in consideration of the promises and agreements of the other party herein contained—each of said promises and undertakings being material and dependent—as follows, to wit:

- 1. Said Bohn Corporation agrees to sell, assign, transfer and set over and hereby sells, assigns, transfers and sets over to The Cleveland Trust Company, as Trustee under the Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922, the entire right, title and interest in and to the United States Letters Patent No. 1,256,265 and in and to the application for United States Letters Patent, Serial No. 201650, named above, together with the right to sue for past infringements of the said patent or of any patent issuing from such application, and to collect damages and profits arising out of such infringement and apply the same to the benefit of The Cleveland Trust Company, as Trustee.
- 2. The Trust Company hereby agrees forthwith upon the execution of this agreement to issue and deliver to said Bohn Corporation or its nominees or assigns, fully paid, One Thousand Five Hundred and Twelve and One-half (1512½) shares of the piston patent estate created by the said Trust Agreement dated March 7, 1922, between the Trust Company and L. P. Mooers et al., there being issued and outstanding at the date of the execution of this agreement Three Thousand (3000) of such shares, exclusive of the One Thousand Five Hundred and Twelve and One-half (1512½) shares so to be issued to said Bohn Corporation or its nominees or assigns.
- 3. Said Trust Company and said Bohn Corporation agree, forthwith upon the execution hereof, to execute the license agreement, a copy of which is hereto attached.

In Witness Whereor, the parties hereto have set their hands and seals to duplicates hereof the day and . year first above written:

> BOHN ALUMINUM & BRASS CORPORATION, By P. A. MARKEY,

Vice-President.

Attest: A. P. LAUER,

Secretary.
(Corporate Seal)

THE CLEVELAND TRUST COMPANY, TRUSTEE, By R. A. MALM,

V.ice-President.

Ch.

Attest: A. J. PERFLER,

assistant Trust Officer.

(Corporate Seal)

Approved for Execution by The C. T. Co.

R. T. S. Counsel.

STATE OF MICHIGAN, COUNTY OF WAYNE, 88:

On the 12th day of October, 1927, personally appeared before me P. A. Markey and A. P. Lauer, to me known to be, respectively, the Vice-President and the Secretary of the Bohn Aluminum & Brass Corporation, and acknowledged to me that they executed the foregoing instrument on behalf of said company and for the uses and purposes therein set forth.

SIMON D. DEN UYL,

(Notarial Seal)

Notary Public.

My Commission Expires May 17, 1929.

STATE OF OMIO, COUNTY OF CUYAHOGA, 88:

On the day of Angust, 1927, personally appeared before me R. A. Malm and A. J. Perfier, to me known to be, respectively, the Vice-President and Assistant Trust Officer of The Cleveland Trust Company of Cleveland, Ohio, Trustee under the Declaration of Trust and Agreement between L. P. Mooers et al., dated March 7, 1922, and acknowledged to me that they executed the foregoing instrument on behalf of said company, as said Trustee, and for the uses and purposes therein set forth.

ELMER L. HAHN,

(Notarial Seal)

Notary Public.

MICRO CARD TRADE MARK (R).



MICROCARD EDITIONS, INC.

PUBLISHER OF ORIGINAL AND REPRINT MATERIALS ON MICROCARD AND MICROFICHES 901 TWENTY-SIXTH STREET, N.W., WASHINGTON, D.C. 20037, PHONE (202) 333-6393







PLAINTIFFS' EXHIBIT NO. 42a.

Franklin Weekly Engineering Report, for the Week Ending October 5, 1918.

(Filed January 27, 1934)

MECHANICAL LABORATORY

ML4U-10000 MILE WEAR TEST

This engine has been built up again and the test has proceeded 8500 miles and will continue on to completion at intervals between our Government work when men are available for attendance.

ML20M-PISTON ENDUBANCE RUNS

Special Long patented aluminum composition pistons. Weight including wrist pin, 2 pressure proof jr.

rings, and one Inland top ring-1.225#.

A full set of those pistons were installed in a regular series nine engine and fitted to the cylinders such that the straight skirt clearance from just below the wrist pin down was from .002" to .003". The lands were all .025" clearance just as they were received. It may be noted that there was four oil holes in the top of each wrist pin boss and also eight oil holes just below the lower ring. The engine, thus built up, was placed on dynamometer #2, fitted with tinware as in a car and the test was carried out according to the method described in ML20M so that results are comparable with those in that report.

In this last test the pistons were installed in such a way that the ribless side was toward the exhaust side

of the engine.

Result; After 10 minutes running, pistons #4 and 6 seized on the exhaust (ribless) side of the piston.

This test will be repeated with the same style of pistons having a straight skirt clearance of .005" and having the ribless side of piston toward the suction side of the engine. To build up the motor in this way and not be obliged to cut away the rib in order to make room for the connecting rod cap screw, the connecting rods will be turned, through 180° and thus have their cap screw on the suction side.

LONG PATENT PISTON—PUBCHASE ORDER #35509—TYPE

250 of these from pattern X-13 are on order at Walker M. Levett Co. To date fourteen of these have We are advised that shipment has been duly received. been made of an additional fifty castings.

TYPE "A."

One hundred and sixty castings have been received of our original order calling for 350 castings from our type "A" pattern #P-2912. After receiving 65 castings we recalled pattern back from Walker-Levett Co. This to enable bringing pattern up to latest blue print. Upon completion same will be returned them for the completion of our order.

SHIPMENTS.

6 Long patent pistons type "A" equipped with rings and wrist pins have been forwarded to our Detroit dealer, Mr. W. J. Doughty.

PLAINTIFFS' EXHIBIT NO. 42b.

Franklin Weekly Engineering Report, for the Week Ending July 20, 1918. (Filed January 27, 1934.)

ML20N-PISTON ENDURANCE RUNS

A regular series nine engine was equipped as follows; (a) New production gauge cylinders, (b) #1 cylinder was equipped with Long patent piston with no rib on suction side, (c) other pistons were regular production magnalite having a clearance of .013" for a distance of 11/2" below the bottom ring and then tapering off to .003" at the skirt.

The engine was then placed on dynamometer #1 and motored in for three hours at 1000 R.P.M. Jackets were installed and a piston endurance run was made under the conditions described in report ML20M.

The run proceeded for 19 minutes when the power failed, thus taking the load off the engine. The horse-power had not dropped sufficient to indicate a "set up."

After allowing the engine to cool off to room temperature a second trial was made and this time the run proceeded for 19 minutes when the motor set up suddenly. #1 special piston set up so tightly and there was a large hole in the top of the piston. Two of the other pistons seized slightly on the exhaust side near the skirt.

PLAINTIFFS' EXHIBIT NO. 42c.

Franklin Weekly Engineering Report for the Week Ending May 3, 1919.

(Filed January 27, 1934.)

MECHANICAL LABORATORY.

ML 4X 10000 MILE WEAR TEST.

The Long Patent pistons with floating wrist pins and straight .003" clearance did not show excessive wear but one piston broke at 75000 miles and the retaining buttons in wrist pin holes had all worked loose, wearing down both the button and the wrist pin hole. One button was broken and one had the horizontal retaining lugs entirely worn away.

The electric welded cylinder did not show any excessive wear nor evidence of failing where it had been welded. This sample was returned to Mr. Babcock.

Practically no carbon was found in spark plug holes

where the threads had been undercut.

The valve lifters with same grinding area as S-5 were in good condition after a total of 15000 miles. Some of the lifters showed scarcely any wear from the action of the cams and none showed excessive wear on the lifting surface. Further work will be done along this line. See tables for wear on wrist pins and wrist pin holes in pistons and connecting rods.

MLAX

PISTON WOOD IN THOMPSOND OF SHINGH AFTER 10000 MILES LONG PATENT TISTENS AWITH FLORIDING WALL PINS

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PLAINTIFFS' EXHIBIT NO. 44.

Letter to E. C. Long from Franklin Manufacturing Company, dated May 9, 1918.

(Filed January 27, 1934.)

H. H. FRANKLIN MANUFACTURING COMPANY Syracuse, N. Y. U. S. A.

May 9, 1918

Franklin Motor Cars

Mr. E. C. Long, Hannibal, Mo.

Dear Sir,

Mr. Franklin has referred your letter of May 6 and

preceding one to the writer.

We shall be glad to have you send us one of the sample pistons which you speak of. If more are needed we can arrange with you to supply them or we could have some made up here.

We shall await with considerable interest the arrival

of this sample,

Very truly yours

H. H. FRANKLIN MANUFACTURING Co. R. MURPHY,

Chief Engineer.

RM/C

PLAINTIFFS' EXHIBIT NO. 45.

Letter to E. C. Long from Franklin Automobile Company, dated April 17, 1918.

(Filed January 27, 1934.)

FRANKLIN AUTOMOBILE COMPANY, Syracuse, N. Y. U. S. A.

Distributors of Franklin Motor Cars

April 17, 1918.

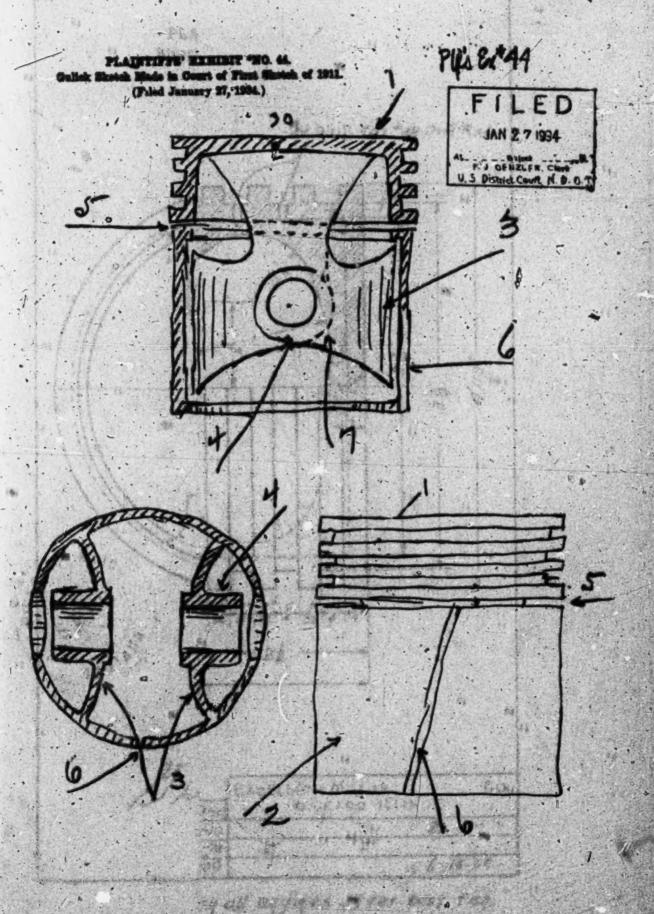
Mr. E. C. Long, Hannibal, Mo. My dear Sir:

I have your letter of April 13 and note with interest that you have a patent piston which shows up well in test. My judgment is that you should arrange to have the piston tested in some laboratory. There are numerous places where you could have the test made, or we would make it for you. Before going ahead we would want full details of the piston or better still a semple of the piston itself. If the piston is all that you think you could put it on the market or you could license its use by manufacturers.

Yours very truly,

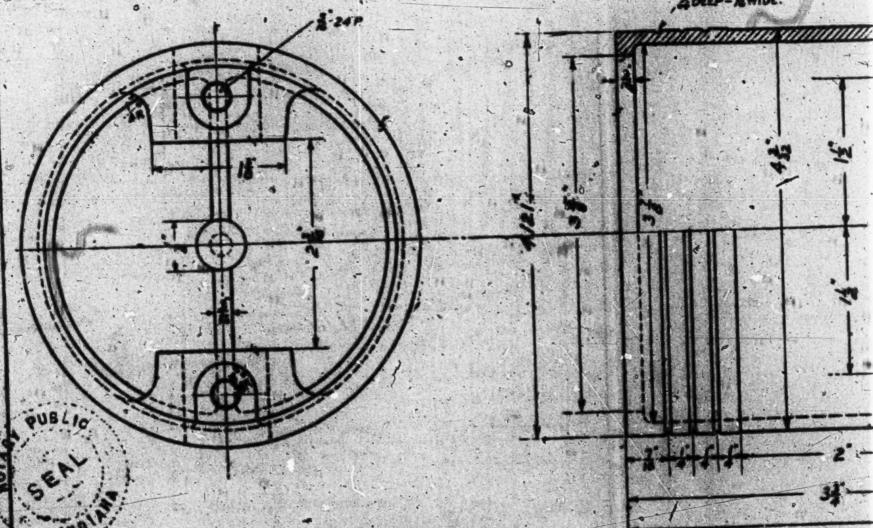
H. H. FRANKLIN,

President.



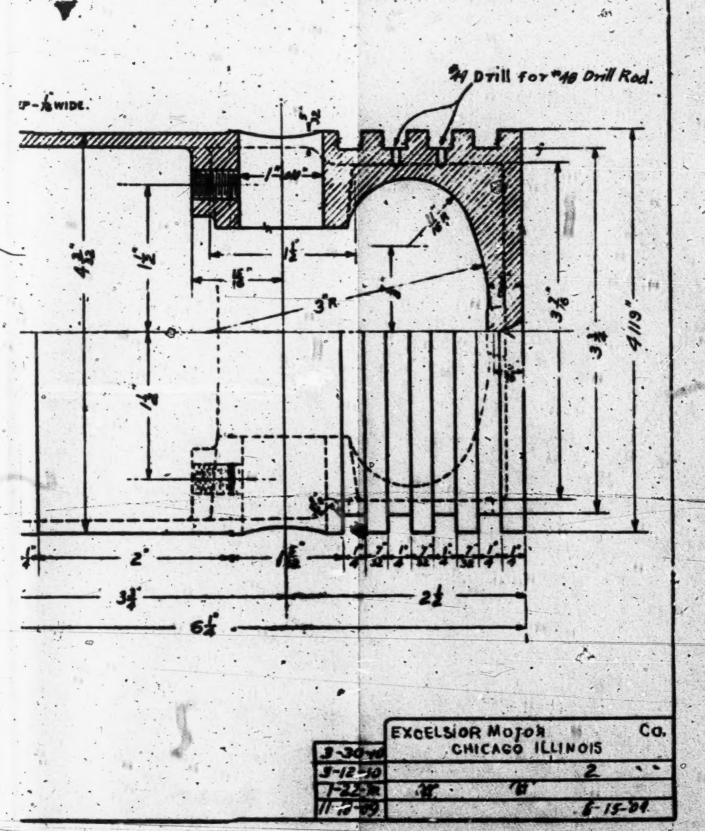
This Mar would be at Latin CONTRACTOR OF THE PROPERTY OF Conneas W. Actor 4 art 17, 1818. April 17, 1911 PLAINTIFFS' EXHIBIT 'NO. 45. Blueprint of Standard Excelsion Motor. (Filed January 27, 1934.)

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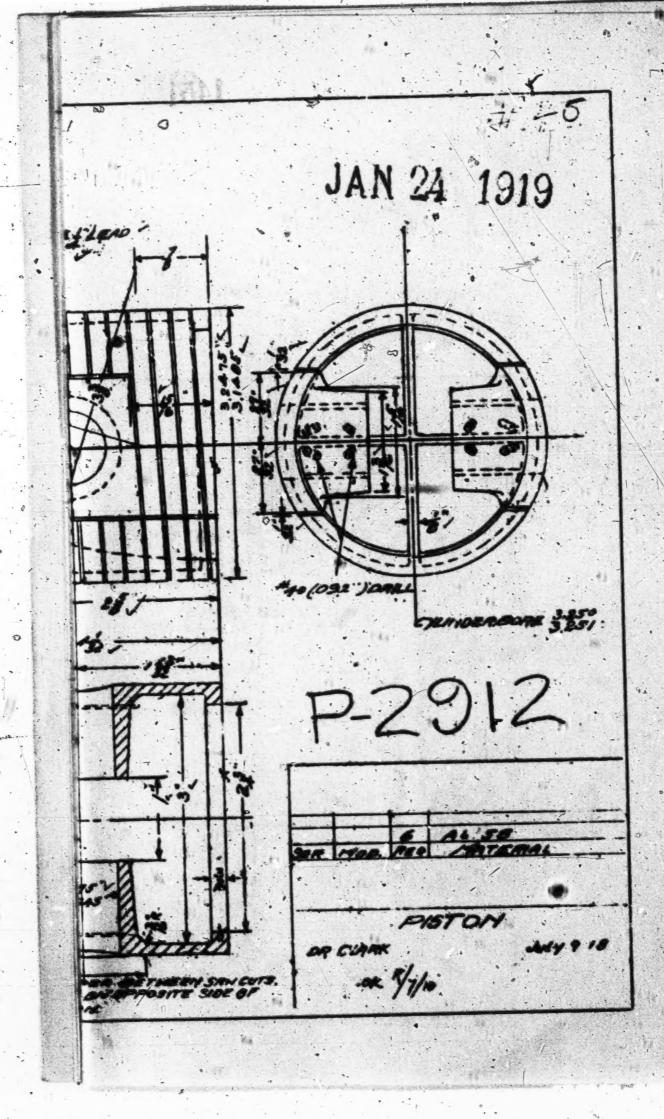
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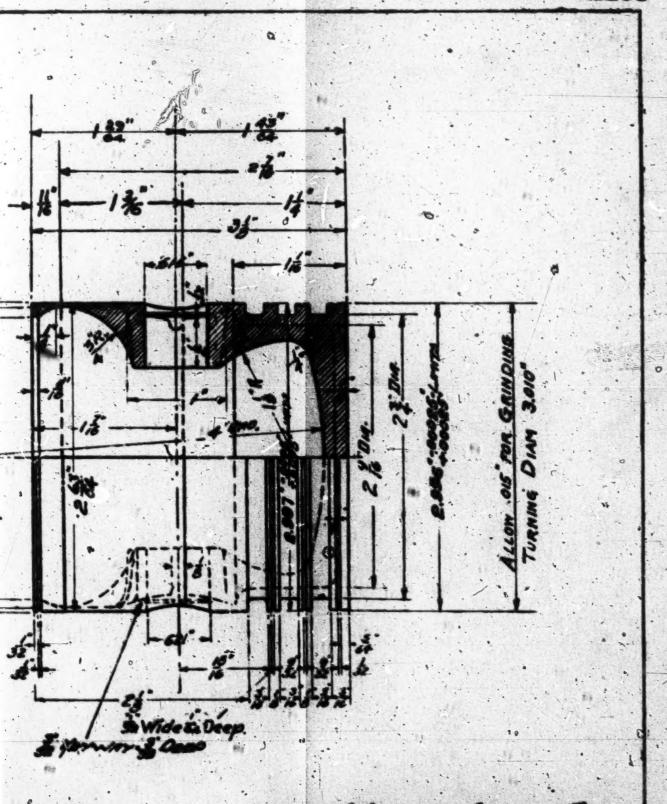
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PLAINTIPPS' EXHIBIT NO. 44. Mineprint P-9019. (Filed January 27, 1984.) was of the Part Land



PLAINTIPES' EXHIBIT NO. 50. Blueprint of Excelnior Motorcycle Platon. (Filed January 27, 1984.) is his thade in them of this common by Cartar of Records (12 for June 19 19 19 19)

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States Reside in Cours of Plates toade
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(Plate Lancery 37, 1734.)

PLAINTIFFS' EXHIBIT NO. 52.

Letter, Packard Motor Car Company to E. J. Gulick, dated March 27, 1916.

(Filed January 27, 1934.)

MT'AKS.

March 27, 1916. Dict. 3-25-16.

Mr. E. J. Gulick, Mishawaka, Indiana.

Dear Sir:-

It is our understanding that you are in a position to obtain for us an assignment of the following Letters Patent:—

> 876,272 January 7, 1908 923,044 May 25, 1909 923,045 May 25, 1909 1,007,097 October 31, 1911

It is our understanding also that you are the sole and exclusive owner of all rights to the inventions illustrated and described on the following exhibit papers which you left in our office yesterday:

1. Slide Valve Motor illustrated on three blueprints marked "A-1," "A-2" and "A-3" and two photographic prints of patent office drawings marked "A-4" and "A-5," respectively.

2. Motor Piston illustrated and described by a pencil drawing marked "B-1," a two page description marked "B-2," and a blue print marked "B-3."

3. Double Acting Air Cooled Piston Motor illustrated and described by pencil drawing and note thereon and marked "C," this pencil drawing being signed by you and dated November 26, 1915, and witnessed by Mr. S. H. Pond, November 26, 1915.

4. Steering Cross Connecting Rod and Drag Link Connections illustrated by pencil drawing and notes marked "D," the drawing covering both sides of the sheet and being witnessed but not dated by Mr. S. H. Pond, and being supplemented by a verbal description given to the writer yesterday in which it was understood that the connection included two forms of ball joints as well so the particular form of pivoted connection shown in the pencil drawing, and

it being further understood that several other drawings of these connections have been heretofore made by you and are at your home at the present time.

It is our understanding, further that for \$2900.00, to be paid by us, you will obtain the assignments for us of the above referred to four patents, and give us assignments of all rights, title and interest in the first three above mentioned inventions relating respectively, to Slide Valve Motors, Motor Pistons and Double Acting Air Cooled Piston Motors, and a license to manufacture or have manufactured for us and to use and sell on our vehicles, the fourth above referred to invention relating to Steering Cross Connecting Rod and Drag Link Connections.

It is our understanding, further, that in view of the fact that there is some slight uncertainty of your being able to obtain assignments of patents Nos. 923,044, 876,272 and 1,007,097, if any one or more of those three patents cannot be obtained for us, the consideration we are to pay shall be reduced \$100.00 each for patents Nos. 876,272 and 1,007,097, and \$200.00 for patent No. 923,044. In any event, however, No. 923,045 is to be obtained for us. In other words, if you obtain an assignment of No. 923,045 only, the amount to be paid is \$2500.00, if No. 923,044 is included also, the amount is \$2700.00, if those two and No. 876,272 are obtained, the amount is \$2800.00, and if all four are obtained the amount is \$2900.00.

It is of course further understood that you will sign all application and other papers that may be necessary for the proper filing and prosecution of patents on the in-

vention referred to.

We hereby accept that above referred to offer and it is our understanding that the papers will be signed up at an early date and the consideration paid to you only upon delivery of the assignments and license to us. Will you kindly acknowledge in writing receipt of this letter and the acceptance of the agreement?

Very truly yours,

PACKARD MOTOR CAR COMPANY.

Patent Counsel.

PLAINTIFFS' EXHIBIT NO. 53.

Letter, E. J. Gulick to Packard Motor Car Company. dated April 1, 1916.

(Filed January 27(1934.)

(Received Apr 3 1916 By Milton Tibbetts)

HOTEL MISHAWAKA Bert De Vault, Manager. Mishawka, Ind., April 1, 1916.

Packard Motor Car Co., Detroit, Mich.

Milton Tibbetts, Counsel.

I have your letter and proposal of the 27th relating to certain Patents and designs. I am now trying to close the deal on that basis, but as explained to you during our recent conference, I am rather uncertain of securing those held by Amplex Co. I am of the opinion at this writing that I shall be able to get them, but it may take two or three weeks to do so. The deal will be closed or off in a very few days for their plant and that will settle the matter one way or the other. Do you wish me to in event of sudden opportunity to close to advise you or Yours truly. Rector1

normal and distribution and the Artist A.

E. J. Gullok.

Box Ed. F. Khen Fig.

PLAINTIFFS' EXHIBIT NO. 54.

Letter, E. J. Gulick to Packard Motor Car Company, dated December 4, 1916.

> (Filed January 27, 1934.) (Received Dec 5 1916 By Milton Tibbetts)

> > Elkhart, Ind., Dec. 4, 1916.

The Packard Motor Car Co., Detroit, Mich.

Gentlemen:-

Attention Milton Tibbetts—Patent Counsel.

Referring to the situation on Patents under date of March 27, 1916 covering your proposition for the following patent numbers—

> 923,044 Jan 7, 1908 923,045 May 25, 1909 923,045 Oet. 31, 1911

I am now in position to deliver these Patents and also include the following numbers—874,676, 923,043, 923,046, 971,038 and 1,031,785. I did not advise you relative to the situation as I was unable until recently to clear up matters owing to the sale and transfer of the Amplex plant. I am now, however, in a position to carry out the agreement and wish to know if you would not be interested also in taking over the balance of these Patents as if I dispose of any of them I would much prefer to dispose of them all. I think without a doubt that I could make the price of the remaining Patents such as would be worth your while to take them over also. Please advise me immediately and I will proceed to close up the subject.

Yours very truly,

E. J. GULICK.

Box 553, Elkhart Ind.

PLAINTIFFS' EXHIBIT NO. 55.

Letter, Packard Motor Car Company to E. J. Gulick, dated February 28, 1917.

(Filed January 27, 1934.)

February 28th, 1917.

Mr. E. J. Gulick, Box No. 553, Elkhart, Ind. Dear Sir:—

Re C-797

From our telephone conversation I understand that you will be in Chicago Friday of this week and that you will call me up at the office of Rector, Hibben, Davis & Macauley, Harrison 821, and make an appointment for sometime that day. If possible want to take the three o'clock train back to Detroit but that of course is not imperative.

Please bring with you all papers that you may have relating to the four several inventions which were included in the original proposition, vis: (1) Slide valve motor; (2) Motor piston; (3) Double acting air cooled piston motor, and (4) Steering cross connecting rod and

drag link connections.

If you will have all of the papers there I will endeavor to give you some definite answer in connection with this matter.

Very truly yours,

MT'EAP.

Patent Counsel, Packard Motor Car Company. 13909

PLAINTIFFS' EXHIBIT NO. 56.

Letter, E. J. Gulick to Packard Motor Car Company, dated May 18, 1917.

(Filed January 27, 1934.)

(Received May 19 1917 By Milton Tibbetts)

Elkhart, Ind.

May 18, 1917.

Mr. Milton S. Tibbetts, Counsel, c/o Packard Motor Car Co., Detroit, Mich.

My dear Mr. Tibbetts:-

It has been several weeks since I turned the several patents over to Mr. Rector's office and have heard nothing definite on the subject up to the present writing. I realize of course that Mr. Rector is a very busy man but thought best to call your attention to the subject. I would very much like to get this matter settled up with as little delay as possible as in accepting your proposi-tion it necessitated my tying up considerable money. I believe the assignments were all straight and the fact that I did not make an assignment to your company was that I anticipated that either yourself or Mr. Rector would desire to draw up such an assignment paper as would meet your requirements covering the several patents as well as the inventions not applied for. I trust you will give this subject your early attention and advise Mr. Pond accordingly, that the subject may be properly adjusted and closed up.

Yours very truly,

E. J. GULICK.

PLAINTIFFS' EXHIBIT NO. 57.

Letter, E. J. Gulick to Packard Motor Car Company, dated March 26, 1917.

(Filed January 27, 1934.)

(Received Mar 31 1917 By Milton Tibbetts)

Elkhart, Ind., Mar. 26-17.

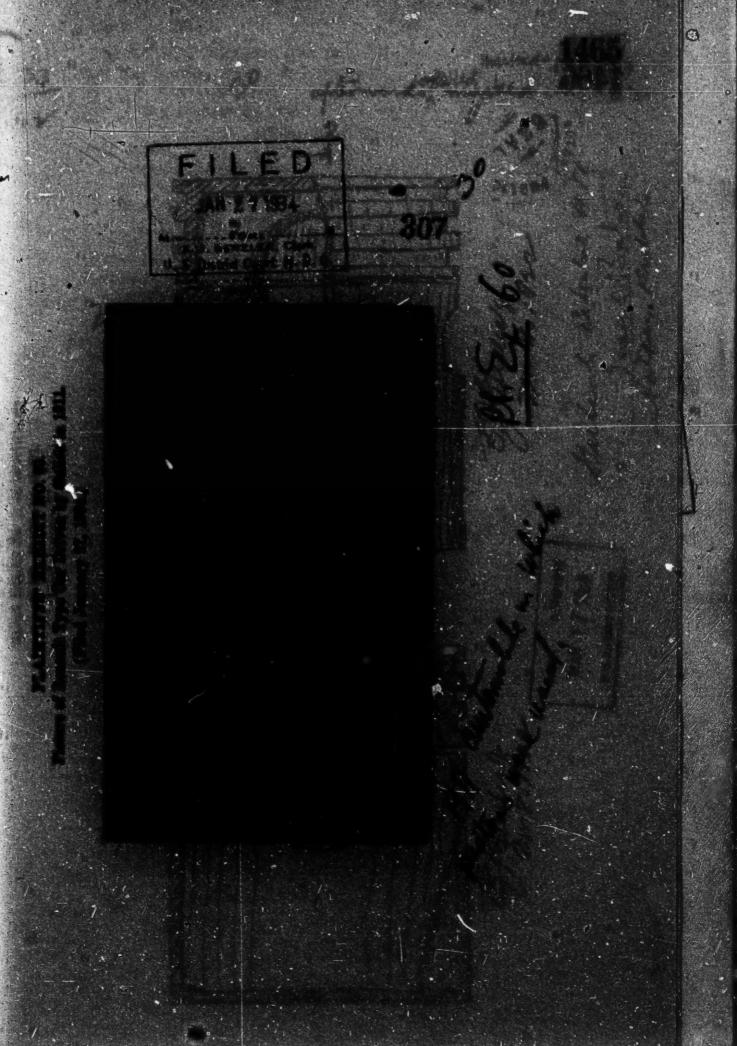
Packard Motor Car Co., Detroit, Mich. Mr. Tibbetts, Counsel.

My Dear Mr. Tibbetts:

I have yours of the 23d and in reply state that the delay was caused only in getting together the records of receiverships and transfers of various patents so that I can give you a clear title to same without question. The matters I now have complete and Mr. Pond has ordered copies from Washington that all may be clear and correct. I received word from him Saturday that he had not received a reply yet but expected to first of the week I can assure you I am not holding up matter and this end. I am so very busy that I have turned over all to Pond and for'd the papers to him as I understood you to say that Mr. Rector would look after your interest from that and and with Pond relative to the details of assignments. I am

Very truly yours,

E. J. GULIOR. -



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ends No. 30, Lenter IN'NYPS' EXHIBIT RO M Ray Stewart Calobo E. (Filed Linuary, 27, 1934.) Angueta . A. Guinek and the transfer Language their treliging ? An Res Out ar ambeke " " planedaajon with - the ranner, I cas to be except 74.1 Millse int . . "Started ground constructed in Low Interior conten be mistoms your THE ME HOUSE TONE or and the hear ext the Excels and they down war hard August 20th 22 mile Wile to be the eile path which we eastle. Pleasely for exercingly, in the two interferences above referred have period in at about Amust 12th, 1911. often to practice. anched to Op o for your emission was discussed I atter date, Jame Sofore June 240 **国本人内容是一种的数据**



PLAINTIPFS' EXHIBIT NO. 63. Letter, Ray Stewart Gehr to E. J. Gulick, August 22, 1923.

(Filed January 27, 1934.)

August 22nd, 1923.

Mr. Edward J. Gulick, c/o Conn Instrument Company, Elkhart, Indiana.

> In Re: Gulick Piston Application Serial No. 204.661.

Dear Mr. Gulick:

In accordance with my telephone conversation with you this forenoon, I am encolsing herewith preliminary statements to be executed by you in the twelve interferences in which your above application has become involved.

In two of these interferences, the claims in issue are broad enough to read upon the pistons which you actually constructed in 1911 and again in 1914. In the other ten interferences, the claims involved will not read upon the pistons you actually constructed but only upon the form of construction with webs joining the bosses to the skirt and the head parts. This latter form of construction is shown in the sketch marked B-1 and which we attached to the history you dictated here in Cleveland. This sketch, I understand, you made sometime while you were with the Excelsior Company in Chicago, prior to the Elgin races of 1911, to which you drove the car just then fitted with the alit and split pistons.

From the Motor Age, Chicago, I learn the Elgin races that year were held August 25th and 26th. This seems to be the only date which we can fix definitely for the sketch B-1 and the pistons which you fitted in 1911.

Accordingly, in the two interferences above referred to, I have named "on or about Avoust 25th, 1911," as the date for your conception, draw ngs, disclosure and reduction to practice. In the other ten interferences, I have named "On or about August 25th, 1911," as the date for your conception and drawings (sketch B-1) and I named "on or about June 20th, 1914," as the date on which you disclosed the invention to others. I placed this latter date, June 20th, 1914, arbitrarily just a few days before June 24th, 1914, the date which appears on the drawings made for you at Mishawaka. Doubtless,

you disclosed this subject matter to the draftsman a few

days before he completed and dated the drawing.

As far as I know, you never constructed pistons as shown in the Mishawaka drawing or the drawings of your application and I accordingly stated in the statements of the ten interferences that the invention has not been reduced to practice by you other than by the filing of your application, such filing, of course, being a "con-

structive" reduction to practice.

The statements must be filed in the Patent Office on Monday, August 27th, and I am afraid that the time is too short for you to mail these statements back to Cleveland, so after you have executed them, I wish that you would mail them direct to the Commissioner of Patents at Washington. You will note that I have placed each statement in an unsealed envelope properly marked for filing in the Patent Office. After you have executed each statement, please return it to its proper envelope and seal the envelope, then enclose all of these sealed envelopes in the larger envelope which I am enclosing and which is addressed to the Commissioner of Patents, Washington, D. C., and at once mail it. You will understand, of course, that only the face copy of each statement is to be placed in its sealed envelope. Of the two carbon copies which I am sending, of each statement, one can be retained by you for your files, while the other should be filled in by you and returned to me for my records.

I think that I have fixed the dates as accurately as it is possible to do it but if you find anything seriously wrong, I suggest that you telephone me at once upon receipt of the statements. I shall be in Cleveland tomorrow, Thursday, but will be in Detroit all day Friday and you can reach me there by calling the Arctic Ice-Cream

Company

Yours very truly,

RSG-MS

P. S. I see that these statements will be too bulky to go in one envelope through the mail, so I am enclosing two stamped envelopes addressed to the Commissioner of Patents and you can divide the twelve statements between them.

PLAINTIFFS' EXHIBIT NO. 64.

Letter, E. J. Gulick to Ray Stewart Gelir, dated August 23, 1923.

(Fited January 27, 1934.)

(R. S. Gehr Aug 24 1923 Received)

C. G. CONN LTD. ELEHABT, IND.

August 23, 1923.

Ray Stewart Gehr, Euclid Building, Cleveland, Ohio.

Dear Mr. Gehr:

I am in receipt of your communication and instructions of August 22nd, covering interferences, Piston Application, Serial No. 204,661, and as far as I can see are as correct as could be expected under the circumstances.

I have today executed and forwarded the face copies to Commissioner of Patents, and also enclosed copies

executed for your files.

By the way, do you not think that it would be a good plan for your clients to own the last Piston Patent which was issued to me? That is the one with the demountable skirt, with which I believe you are familiar. I am not asking no great amount for this as I realize this one patent by itself is of no great consequence, however, it would add a link in the chain of patents controlled by your clients. I would consider at the present time any reasonable offer. Would be pleased to hear from you on the subject.

Yours very truly,

E. J. GULION.

EJG:MH (Enclosure)

Box 553.

PLAINTIFFS' EXHIBIT NO. 65.

Gulick Deposition on Interferences 49,569, 49,570 and 49,571, pages 40 to 103, inclusive.

(Filed January 27, 1934.)

Patent Office Interference Exhibit Numbers			This Transcrie Exhibit Number	
Gulick Ex	k. 1	Gulick 1911 piston sketch	Ptf.	
	2	Gulick written description	14	
	3	Letter, Packard Motor Car Co to Gulick 3/27/16	"	
	4	Blueprint of Standard Excelsior mo-		
	5	Piston used by Excelsior Motor	**	
	6	Pattern used by Excelsior Motor & Mfg. Co.	**	
"	7	Core-box used by Excelsior Motor & Mfg. Co.	"	
"	8	Reproduction of piston as used by Ex- celsior		
6666	9	Detail of piston shown in Exhibit 31		
- 4	10	Cross-section drawing Gulick sleeve		
	11	Gulick Ex. 11 in Interferences 49,569-70-71		
	12	Letter, Gulick to Packard Motor Car Co., 4/1/16		
66 .60	13	Letter, Gulick to Packard Motor Car		
		Co., 3/26/17	"	
	14	Letter, Gulick to Packard Motor Car Co., 12/4/16	_ 44	
	15	Letter, Packard Motor Car Co. to Gulick, 2/28/17	**	
44	16	Letter, Gulick to Packard Motor Car Co., 5/18/17	44	
44 .4	17	Excelsior motorcycle piston	"	
44 4		Print of above	**	
	19	Gulick piston	**	
		Picture Renault type car driven by Gulick in 1911		
	1		41	

Ptf. 92A

92B

pany Drawing

pany Drawing

pany Drawing

D-944X H. H. Franklin Manufacturing Com-

" D-960X H. H. Franklin Manufacturing Com-

IN THE UNITED STATES PATENT OFFICE.

STEPHEN D. HARTOG

VS.

ELMER C. LONG

VR.

EDWARD J. GULICK.

ELMER C. LONG

STEPHEN D. HARTOG

EDWARD J. GULICK.

ELMER C. LONG

EDWARD J. GULICK.

Interperence No. 49,569.

Interperence No. 49,570.

Interference No. 49,571.

TESTIMONY TAKEN AT SOUTH BEND, JULY 21, 1926.

Testimony taken in behalf of Edward J. Gulick pursuant to the annexed notices, and by agreement of counsel, in the office of Frank Batson, Notary Public is and for St. Joseph County, Indiana, Court Reporter County Courthouse, South Bend, Indiana, beginning at 10:30 o'clock A. M., July 21, 1926.

Present: Ray S. Gehr, F. O. Richey and William C. McCoy on behalf of Edward J. Gulick. L. C. Kings land on behalf of Stephen D. Hartog. H. C. Fletcher on behalf of Elmer C. Long.

DEPOSITION OF EDWARD J. GULICK.

EDWARD J. GULICK, appearing as a witness in his own behalf, having first been duly sworn, testifies as follows in response to interrogatories of counsel: [40]

^{*} Pigures in brackets indicate the ends of the pages of the Patent Office Deposition.

DIRECT EXAMINATION by Mr. F. O. Richey.

Q. 1. Please state your name, age, residence and occupation. A. Edward J. Gulick, 58 years old, residence, Elkhart, Indiana, 2404 South Martin Avenue, works manager and chief engineer in the C. G. Conn Limited, Elkhart, Indiana.

Q. 2. Are you the Edward J. Gulick, the applicant in the United States for letters patent, serial number 204,661, filed November 30th, 1917, and involved in the

above entitled interference! A. Yes.

Q. 3. Beginning just prior to the year 1911, will you give a general outline of your employment up until the present day, stating the periods of employment, the dates when you changed employment, the character of each employment, the name of the concern and the character of its product? A. Prior to 1911 and up until September, 1910, I was connected with the Amplex Motor Car Company as secretary and general manager. After Septemer, 1910, until the 1st of January, 1911, I was connected with the Excelsior Motor and Manufacturing Company of Chicago, Illinois, as works manager. From January 1st, 1911, until November 1st, 1911, I was connected with the Excelsior Company in the same capacity: After November, 1911, and until the early part of 1914, I was not connected with any company, but was engaged in a general way in the project organizing a new Motor Manufacturing Company. This, however, was not completed until about the 1st of June, 1914, at which time a Mr. Pulsifer and myself took over from the receiver, M. W. Mix, the Amplex Motor Car Company of Mishawaka, Indiana. A company was organized known as the Amplex Manufacturing Company, and was op-erated until about the 1st of November, 1914, when it went into the hands of a receiver, Kamm. From then on until about the 1st of March, 1915, I was engaged in an attempt to recover the property from the receiver. As I did not succeed, I then became connected as works manager and chief engineer of C. G. Conn, Limited, Elkhart, Indiana, in which capacity I am at the present time.

Q. 4. The Amplex Motor Car Company was located where? A. Mishawaka, Indiana.

Q. 5. What did they make? A. Automobiles. [41]

Q. 6. What did the Excelsior Motor and Manufacturing Company make? A. Automobile motors, motorcycles and motorcycle motors and bicycles.

By Mr. Richey: I produce a sketch and ask that it be marked for identification, Gulick Exhibit No. 1.

Q. 7. Referring to this sketch, Exhibit No. 1, will

you state who made it, if you know? A. I made it.

P.

Q. 8. How do you identify it as your work? A. Well, I don't think anybody would make one just like it, and, being, my own work, I can't help but identify it. I can identify my handwriting. The upper writing above the section marked "A" is my handwriting; also, "C" and "D"; and the writing below "B" and the signature.

Q. 9. How about the reference numbers and lines?

A. The reference numbers and lines are also in my handwriting. All of the marks on the sheet exhibited, with the exception of that marked "Gulick Exhibit No. 1" and that marked "B-1" in blue pencil, are my writing.

Q. 10. Where and when did you make this drawing?

A. This drawing was made shortly after the 1st of January, in 1911, at my residence, 6658 Lowe Avenue,

Chicago.

Q. 11. How do you fix the date which you have given for the making of this sketch! A. Shortly after or about January 1st, 1911, Excelsior Motor Company decided to go into the motorcycle racing game. A motordrome for motorcycle racing was expected to be opened in the early spring, and the Excelsior Company was experimenting with racing motors. Considerable trouble was experienced with the ordinary type of piston, and to eliminate those troubles, I sketched up the piston as shown as Gulick Exhibit No. 1.

Q. 12. What kind of a piston is shown in this Exhibit 1—a motorcycle or automobile? A. This is intended for a motorcycle, but could be used as well for an

automobile motor.

Q. 13. To whom, if anybody, did you disclose or show this drawing, Exhibit 1? A. It was shown to my wife and, I think, to one or two other parties, friends of ours, at the time. [42]

Q. 14. Do you remember the circumstances under

which you showed this to your wife? A. I do.

Q. 15. Will you recite them briefly?

By Mr. Kingsland: The question is objected to as incompetent, calling for a disclosure to a witness not qualified to testify.

A. I disclosed this to my wife and explained it to her, and further advised her that I believed it was a

good idea, as I wished her to be thoroughly familiar with it in case that anything should happen to me, she might be able to derive some benefits from it.

Q. 16. When was this disclosure made? A. In the

early part, shortly after the 1st of the year, 1911.

Q. 17. Is your wife living now? A. She is not.

Q. 18. When did she die! A. In April, 1914.

By Mr. Kingsland: The testimony of this witness of making of drawings or disclosures prior to August 25, 1911, is objected to as contrary to the preliminary statements.

By Mr. Fletcher: The same objection. By Mr. Richey: Notice is given that motion will be made to amend the preliminary statements of Mr. Gulick so that they shall conform to the date given in the testimony, at a seasonable time. though a careful and diligent search was made before the preparation and filing of the preliminary statements, more recent investigations have developed further information.

Q. 19. When was the motordrome for motorcycle racing referred to in your answer to Q.11 opened in Chicago? A. It was opened for preliminary work several weeks prior to the official opening in July of 1911. The reason for this was that the track was complete, but the seating capacity had not been completed up

until the official opening.

Q. 20. Have you any other way of fixing the date of the making of Exhibit 1 than you have named? A. None other except that we made a set of these pistons for a motorcycle motor which was block tested to be used in a racing motor prior to the official opening. Further the pistons used in this test were of the [43] standard racing type and were split to develop the split skirt idea, but were not ribbed exactly as shown in this sketch.

Q. 21. By official opening, you mean the official opening of the motordrome, do you not? A. I mean the official opening of the motordrome to the public in July,

1911.

Q. 22. Was this before or after the receivership of the Excelsior Company! A. After the receivership.

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Q. 23. Will you give a brief description of the block test of these motorcycles tested, and say how they operated, and what they did? A. These pistons were put in a specially constructed two-cylinder, air-cooled motorcycle motor, and they were put on the test block and ran for several hours, and the pistons used in these motors for racing purposes were of a very light semisteel construction, and as the standard piston for this purpose was not ribbed according to the sketch, but the skirt was split, weakened them, and they were not put in the races. As to just the nature of the breaking up of them, I cannot say. The speed of this motor was something over four thousand R. P. M. Had they been constructed particularly for the work as per sketch, the troubles experienced would not have occurred. They, however, demonstrated in this test their ability to run and adapt themselves without seizing or scoring, which was one of the troubles with the standard type piston.

Q. 24. Did you do any experimental work on racing motorcycles at any other time than during the first part of 1911? A: No other work in connection with this pis-

ton on a motorcycle.

By Mr. Richey: I offer in evidence as Gulick's Exhibit No. 1 the drawing marked for identification

Gulick Exhibit No. 1.

By Mr. Kingsland: The offer in evidence of Exhibit No. 1 is objected to on the ground that it is not warranted by the preliminary statement; on the further ground that it has not been sufficiently proven, and upon the further ground that it has not been connected with the issues of the interference, and is therefore incompetent and immaterial.

By Mr. Fletcher: Same objection. [44]
By Mr. Richey: The notary is requested to
mark for identification the two pages of written matter which are now produced, Gulick's Exhibit No. 2.

Q. 25. Who wrote up the description of Exhibit No. 21 A. I did.

Q. 26. How do you identify it as your work? A.

It is my handwriting.

Q. 27. Where and when was this Exhibit No. 2 written up by you? A. In the early part of 1911, shortly after the first of the year, and at the same time that Exhibit No. 1 was made.

Q. 28. And at the same place? A. Same place.

Q. 29. Were the two of them ever attached together?
A. They were.

Q. 30. What construction is described in Exhibit 21

A. A construction as shown in No. 1.

Q. 31. I will ask you to read the descriptive matter of Exhibit No. 2 in the record.

A. "Relating to an Engine Piston which provides for and prevents seizing, binding or scoring when hot or oversize. It is a well known fact that all engine pistons are necessarily made smaller than the cylinder in which they operate to provide for lubrication and prevent scizing or cutting due to the expansion of the piston in the cylinder when hot.

1. The piston consists of a head 1 having a groove 6 for carrying packing rings and a body 2, which provides bearing surface and which is split as indicated by 7 to provide for expansion.

2. The Head 1 and Body 2 are held together be the ribs 3 and 4. Ribs 3 and 4 carry bosses 5 for receiving the piston pin. Ribs 3 and 4 are not limited to shape or position, and the number of ribs and location and shape may be altered as desired.

The head 1 is machined small enough to allow for expansion and not bind or seize, while the body 2 is machined as close to size as is possible to make a fit and any expansion is taken up by the slot 7 and which prevents any seizing or binding between the piston and cylinder walls in which the piston [45] moves. By this construction it is possible to make a fit that prevents any pounding which, is prevalent with the common type of piston."

Q. 32. By whom or to whom was Exhibit 2 read?

It was read to my wife.

Q. 33. State when and under what circumstances?

A. It was read to her in the early part of 1911, in the evening at the time of which the sketch was made and at the time at which these specifications were drawn up.

Q. 34. You brought a patent suit against the Packard Motor Car Company, didn't you? A. I did.

Q. 35. When was this, to the best of your recollection? A. About the middle of the year of 1913.

Q. 36. In what court was this suit brought? A. Chicago, Cook County.

Q. 37. It was in the Federal Court, wasn't it? A. I believe it was.

Q. 38. Was that the only suit you brought against

the Packard Company on a patent? A. It was.

Q. 39. Now, did the events which you have recited regarding Exhibits 1 and 2 occur before or after the bringing of this suit? A. Before.

Q. 40. Where have Exhibits 1 and 2 been since they were made by you in the first part of 1911? A. They were in my possession until turned over to Offield, attorney, of Chicago, and later to S. W. Pond, of Pond and Wilson; later they came into my possession and were turned over to the Packard Motor Car Company; since turning them over to them, do not know just where they have been.

Q. 41. When were they turned over to the Packard Company? A. It was about a year after my settlement of a suit with the Packard Company in 1915, which I

think was in 1916.

Q. 42. To whom did you deliver them for the Pack-

ard Company? A. To Milton S. Tibbetts.

Q. 43. He was and is still the patent attorney for the Packard Company! A. He is.

Q. 44. Did you deliver them to him in Detroit! A.

Q. 45.0 Did he write you a letter about them later! He did.

Q. 46. Can you produce that letter? A. I cannot.

Q. 37A. Have you searched for it? A. I have. Q. 38A. Do you know where it is? A. I do not.

By Mr. Richey: I offer in evidence, as Gulick's Exhibit No. 2 the descriptive matter so marked for identification.

By Mr. Kingsland: The offer in evidence of Exhibit No. 2 is objected to on the ground that it is not warranted by the preliminary statements and upon the further ground that it is not evidence of the invention covered by the counts in the interferences.

By Mr. Fletcher: Same objection.

By Mr. Richey: I produce a copy of a letter from Packard Motor Car Company to E. J. Gulick, March 27, 1916, and ask that it be marked for identification, Gulick Exhibit 3.

Q. 39A. Will you look at Exhibit 3 and if this refreshes your recollection as to the date when you left Exhibits 1 and 2 with Mr. Tibbetts, will you state that date as near as you can?

By Mr. Kingsland: The question is objected to as incompetent as requiring a double inference, the letter of which a copy has been produced is the best evidence and no proper basis has been laid for the reference to a copy.

A. I was in Detroit the day prior to the writing of this letter, Exhibit 3, which would be either March 24th or 25th, 1916, as according to this Exhibit 3, Mr. Tibbetts dictated this letter on the 25th.

Q. 40A. Now can you state the date when you left Exhibits 1 and 2 with Mr. Tibbetts? A. Exhibits 1 and

2 were left on the same date, while in Detroit.

Q. 41A. That is, on the 24th or—25th of March,

19161 .A. Yes.

Q. 42A. Did you show this Exhibit 2 to anyone except your wife, prior to the time you showed it to Mr. Offield! A. Not that I recall.

Q. 43A. About what were the dates that you showed Exhibits 1 and 2 to Mr. Offield and to Mr. Pond? A. [47] Exhibits 1 and 2 were turned over to Mr. Offield, as near as I can recall, in 1913.

Q. 44A. The descriptive matter in Exhibit 2 refers to the construction shown in Exhibit 1, does it not? A.

It does.

Recess until 2:00 o'clock P. M.

Q. 45A. Were Mr. Offield and Mr. Pond experienced in motors so that they were capable of understanding the disclosure of Exhibits 1 and 2?

By Mr. Kingsland: The question is objected to as calling for a conclusion or opinion of the witness.

A. As attorneys experienced in handling such mat-

ters, yes.

Q. 46A. Both of these men were patent lawyers who had been in practice, to your knowledge, for years before you made the disclosures to them, were they not? A.

They were.

Q. 47. Now you have said that you fixed the dates when you made Exhibits 1 and 2 and the dates of the associate events you have related as prior to the opening of the Chicago motordrome, as prior to your suit against Packard, and as prior to your wife's death, are there any other events by which you can fix the dates when you made Exhibits 1 and 2 and the associate events, and if so will you state what they are? A. The Exhibits 1 and 2 were made prior to the Excelsior plant being turned over to Schwinn, the purchaser, in November, 1911; also the paper on which these sketches were made were an inferior grade of bond paper which was purchased by the Amplex Motor Car Company, a quantity of which I had taken to my home in Mishawaka, and

later, when I moved to Chicago, about the 1st of December, 1910, I took it with me. This paper was used principally for sketching, and some of it remained in my possession until 1914, the time which my wife died. At that time it was scrapped, as all my possessions were sold.

Q. 48. That is, you mean that such of this paper as was on hand in 1914, when you moved back to Mishawaka, was destroyed? A. Yes. [48]

Q. 49. The description of the construction shown in Exhibit 1 and which description is on Exhibit 2, says that "any expansion is taken up": will you explain how this expansion was taken up in the piston illustrated in Exhibit 1? Or how you intended it to be so taken up? A. The object of the slot 7 was to permit of the closing up of the body 2; the body being sufficiently flexible to permit of closing up slightly of slot 7. By this slot, the action would be similar to the closing of a piston remains

Q. 50. What would happen to the webs or ribs 3 and

4 during this expansion and contraction?

By Mr. Kingsland; The question is objected to as incompetent on the ground that the witness has not qualified to interpret the disclosure as shown by the Exhibits adduced, and the witness has testified to no fact justifying his supplementing the disclosures of these exhibits.

A. Ribs 3 and 4 would flex slightly in connection

with body 2.

Q. 51. Of what material were pistons made in 1911?

A. They were called semi-steel, a gray-iron mixture with steel introduced.

Q. 52. What material did you contemplate for the piston illustrated in Exhibit 1 and described in Exhibit 2? A. No specific material was specified. Either gray iron or aluminum could be used, depending on the design and its requirements.

Q. 53. Webs of these materials would be flexible, wouldn't they! A. They would to a degree sufficient to provide the necessary flexibility to prevent seizing or

scoring.

Q. 54. The motorcycle pistons which were made in 1911 with the slits in them, as you have testified, were made of what material? A. Semi-steel. At least that is what it was supposed to be.

Q. 55. State whether or not the piston shown in Exhibit 1 could operate as described in Exhibit 2 without

some flexing of the ribs or webs 3 and 4. A. It could not, without a very slight flexing of the ribs.

By Mr. Kingsland: It is now moved that all evidence in connection with Exhibits 1 and 2 be struck out on the ground that the structure there [49] disclosed upon the admissions of this witness are inoperative.

By Mr. Fletcher: The same objection as noted

by Mr. Kingsland.

Q. 56. Did the Excelsior Company have a Renault type of automobile while you were with the company, and particularly during the year 1911? A. They did. Q. 57. Who operated this car? A. I operated one

of them.

Q. 58. What kind of pistons were in the Renault type of car that you operated? A. During the period of a year they had a split skirt piston installed in the motor.

Q. 59. What kind of piston was in the car before the installation of the split skirt piston? A. A standard

type piston.

By Mr. Richey: The notary is requested to mark for identification the blue print which I produce, Gulick's Exhibit No. 4, and the piston which I produce, as Gulick's Exhibit 5.

Q. 60. Will you compare the piston in the Renault type of car before the installation of the split piston with the piston illustrated in Exhibit 4 and the piston Exhibit 5? A. Exhibits 4 and 5 are the same piston, but are not of the split type, and are the same as was installed in the Renault car prior to the installing of the split piston.

Q. 61. Do you know where Exhibit 4 was made, or anything else about its history! A. It was evidently made in the drawing room of the Excelsior Motor Manufacturing Company, and as the motor was designed by L. P. Mooers, I believe that Exhibit 4 was designed by him.

Q. 62. Was it the custom with the Excelsior Company to print its name and place the dates on its tracings when you were there? A. It was.

By Mr. Richey: The print marked for identification is offered in evidence as Gulick's Exhibit No. 4.

By Mr. Kingsland: To the introduction in evidence of Exhibit No. 4 is objected to on the ground that it is immaterial and has not been connected in any way with the matters involved in this interference. [50]

Q. 63. Do you know where Exhibit 5 came from?
A. I do not. I never saw it before. But from its dimensions and appearance, I would say it was made from the

blue print Exhibit 4.

Q. 64. Did you see Exhibit 4 or the tracing from which it was made or any other print made from that tracing while you were employed with the Excelsior Company? A. I cannot say that I ever saw the tracing, but I have seen numerous prints same as Exhibit No. 4 in the machine department of Excelsior Motor Manufacturing Company during the period of 1911, as this was a standard type of piston for the Excelsior motor.

Q. 65. Who molded these pistons in 1911? A. A few of them were made by a Chicago foundry. I cannot recall their names. The major portion of all of them, to the best of my recollection, were cast by a concern in the east. I believe it was the Manufacturers Foundry Company, as they cast all of the motor cylinders, I believe

they also cast the pistons.

Q. 66. Were any of these pistons made by a concern in Cleveland, Ohio? A. They might have been, as the purchasing department were compelled to secure them at times at different places.

By Mr. Richey: Piston marked Gulick's Exhibit 5 is offered in evidence as Gulick's Exhibit 5.

By Mr. Kingsland: The introduction in evidence of Exhibit No. 5 is objected to as incompetent, as the witness was unable to identify it, and it is further objected to as immaterial, not having in anywise been connected with the matters in controversy.

No. 5 in evidence is objected to on the ground that it has not been sufficiently identified, and on the further ground that the exhibit is not in any way con-

nected with the issues involved.

By Mr. Richey: I now produce a pattern and ask that it be marked for identification Gulick's Exhibit 6; and a core box, and ask that it be marked Gulick's Exhibit 7.

Q. 67. Will you look at the pattern and core box marked Exhibits 6 and 7 and state what they are and what you know about their history? A. Exhibit 6 is a [51] pattern for piston as shown in Exhibit 4, and Exhibit 7

is the core box of same. The Excelsior Motor Company were the owners of these patterns and core boxes, the product of which was used in the manufacture of Ex-

celsior motors during the year of 1911.

Q. 68. Can you tell if Exhibit 5 was made with Exhibits 6 and 7? A. I cannot say that Exhibit 5 was made from the pattern, Exhibit 6 and from the core box, Exhibit 7, as the Excelsior Motor Company had several of these same patterns and core boxes exactly duplicat-

ing Exhibits 6 and 7.

Q. 69. You have said that the pistons like Exhibit 5, which were in the Renault type car you operated in 1911, were taken out and slitted: can you explain how they were slitted? A. The pistons as used in the Renault cars were new pistons and were slotted across the top of the skirt just below the upper ring between the piston pin bosses on one side fonly, and were then diagonally slotted throughout the length of the skirt on one side, being the same side.

By Mr. Richey: I ask that the piston which I now produce be marked for identification Gulick's Exhibit 8.

Q. 70. Will you compare the piston Exhibit 8 with the slitted pistons which were placed in your Renault car in 1911? A. They were the same in the car as Exhibit 8.

Q. 71. How many of these slitted pistons were in-

stalled in this car? A. Four.

Q. 72. This was an air-cooled car? A. It was not:

it was a water-cooled.

Q. 73. When were these slitted pistons like Exhibit. 8 installed in your Renault car? A. They were made during the month of July, 1911, and after passing through the test department, were installed in the Renault car just prior to the Elgin road races which were near the middle of August in 1911.

. Q. 74. Have you any other way of fixing the date of the making and installation of these slit pistons? A.

Yes.

Q. 75. Will you recite them? A. After the block test, the first time the Renault car was driven on the road with the split pistons installed was to the Elgin [52] races; further, that these pistons were being made at the time we were experimenting with motorcycle engines for racing purposes at about the time of the Chicago motordrome; by this, I mean the official opening. Further, I would state that it was quite necessary to do a lot of

special work in installing this motor, and there was a great deal of rush to get it done in time to drive it to

Elgin.

Q. 76. Did you see the slits cut in any of these pistons? A. I don't know that I saw them while they were cutting them, but I saw them before they were installed in the motor.

Q. 78. Who gave the instructions for slitting them?

A. I did.

Q. 79. To whom? A. To the best of my secollection, they were given to a Mr. Johnson, who was foreman of the tool room where this work was done. It is possible, however, that some of the work may have been done in the piston production department under the instructions of Mr. Johnson to the foreman, Mr. Biers.

Q. 80. Did you see these pistons installed in the car? A. I saw them when they were installing them in the motor, prior to its going to the test block, but did not see them afterwards until the motor was torn down.

Q. 81. Who installed them in the carf A. Morris

Engle installed the motor in the car.

Q. 82. Who installed the pistons in the motor? A. There were a number of employes engaged in this work, and I do not know their names.

Q. 83. Of what material were the pistons made? A.

A selected quality of gray iron.

Q. 84. What was the clearance between the slitted pistons and the cylinder walls? A. The head clearance about the rings was made the same as the standard piston, which was about seven thousandths; the skirt clearance was made to fit the cylinder walls as close as it was

possible to fit them in dry.

Q. 85. Can you give the skirt clearance in thousandths of an inch? A. Not more than one and one-half thousandths. Practically impossible to get much closer owing to the fact that the pistons were seldom absolutely round after the final finish grinding, which was [53] seldom perfectly true. With a perfectly true bore and a perfect piston they could be fitted somewhat closer and not seize.

Q. 86. How did this compare with the skirt clearance of the standard type unsplit piston used in this motor prior to the installation of those like Exhibit 8f A. The standard piston specifications were for four thousandths clearance of the skirt; however, there was a variation in cylinder bore and piston diameter, and the clearance usually varied from four to seven thousandths.

Q.87. You have spoken of block tests of pistons like Exhibit 8: will you explain these block tests, stating where they were made, when they were made, and by whom they were made? A. By block tests was meant putting the motor in a test frame; the motor is then run by belt or by attaching another motor to it for a period of four hours or more. It is then put under its own power for a period of time, running under that load; later the load is increased and the final test for power, speed and so forth, either a brake is used, and which was used at that time, and at the present time most of the motors are tested for power loads by electric generator for absorbing the load. This motor was tested as above described by brake, as a number of testers were employed in that department, do not know who made the test; but was present when it was being run. This test was run in August, 1911, at the Excelsior Motor Company plant test room just prior to the Elgin races.

Q. 88. Who saw it besides you! A. Morris Engle saw the motor running on the block, the same Morris Engle as installed it in the car. Others saw it, but I

do not know their names.

Q. 89. How long did it take to make the test? A. The motor went on the block late in the afternoon, was run all night, came off the following day late in the afternoon, and was installed that evening, and the next morning early completed, which was the day of the Elgin races.

Q. 90. You drove it to Elgin with the split pistons

like Exhibit 8 in it, did you? A. I did.

Q. 91. Did you drive it on any other trips? A. I

Q. 92. How far did you drive this car with the split pistons like Exhibit 8 in it? A. I would say at least three thousand miles.

Q. 93. Over how long a period of time? A. From the day of the Elgin races in August until about the

middle of October, 1911.

Q. 94. At what speeds did you drive your car with these pistons installed? A. It was driven at all speeds up to sixty miles an hour.

Q 95. Do you remember a trip you took with Mr.

Williamsont A. I do.

Q. 96. Will you state who was on this trip, what was the length of the trip and when it was made? A. This trip was made about the first of October. Mr. Williamson and his wife, myself and my wife, drove from Chicago

to Mishawaka, Indiana, and return, two days, and

travelling all told around three hundred miles.

Q. 97. Will you describe how these pistons like Exhibit 8 operated in the motor of your car during its use by you and when the block test was being made? A. During the block test they operated perfectly; and during the road work, from the time they were installed in August and until about the 1st of October, they worked entirely satisfactorily. On the trip to Mishawaka, about the last of October, on the return, near Michigan Oity, they developed trouble, a peculiar sound in the motor indicated trouble. I called Mr. Williamson's attention to it, told him I believed something had gone wrong with one of them. This trouble, however, was evidenced only at speeds above thirty miles an hour. On my return to Chicago the car was driven for a few days in October, and then torn down. That is, the motor was removed, and an examination disclosed that one of the pistons only had cracked through from the slot below the lower ring into the piston boss. This caused a slight enlargement of the piston pin hole, which was responsible for the noise which we heard. The pistons were removed from the motor and standard type pistons installed. That was the last they were used in the Excelsior motor. This was October, 1911.

Q. 98. What was the condition of the other three Exhibit 8 pistons? A. They were in perfect [55] condition. There was no signs of cutting or scoring, and the motor never exhibited at any time any signs of piston

slap or laboring.

Q. 99. The noise in the injured piston was due to the fact that the pin was loose in the enlarged hole, was

it not? A. It was,

Q. 100. What, if anything, did you say to Mr. Williamson on this trip about the slits in the pistons? A. I explained to Mr. Williamson how these pistons were constructed, and as he was an automobile man of some years' experience, he was very much taken with the idea; and further, I told him, after I had removed the pistons, explaining to him the causes of the noises which we had heard on the trip.

Q. 101. Where are these pistons now? A. I do not

know.

Q. 102! Do you know what became of them? A. I do not, as the Excelsior Motor Company was sold shortly after the first of November, 1911, and much of the

motor material which was considered as scrap was dis-

posed of prior to his taking it over.

Q. 103. Who removed the pistons from the motor?

A. The motor was torn down in the erecting department, and I do not know the employes' names who did the work.

Q. 104. Do you know of anyone else than those you have named who saw any of these Exhibit 8 pistons? A. There were a number of Excelsior employes who saw them, but I do not know their names.

By Mr. Richey: The piston marked for identification Exhibit 8 is offered in evidence as Gulick's Exhibit No. 8.

By Mr. Fletcher: The introduction in evidence of Exhibit No. 8 is objected to as incompetent on the ground that it has not been sufficiently identified.

By Mr. Kingsland: It is obvious that the testimony of this witness in relation to Exhibits Nos. 5 to 8 inclusive is immaterial to the counts of the interferences Nos. 49,569 and 49,570, in which the party Hartog is interested. If it is counsel's intention to urge any materiality, I now desire to make it clear that an objection is made to any testimony [56] concerning these exhibits as being applicable to the two interferences above numbered.

Q. 105. Will you explain why you slitted pistons like Exhibit 8 and used them instead of making them up like shown in Exhibit 1 in 1911? A. Excelsior Motor Manufacturing Company at that time was in the hands of creditors committee one a receivership and I had instructions from the chairman of the committee to make no expenditures on experimental work for automobile motors, as it was the intention to discontinue the manufacture of automobile motors in event of the receivership being dismissed. Therefore, I could not make up any special constructions.

Q. 106. Was the Excelsior plant sold, and if so, when, and to whom? A. Excelsior plant was sold to a man by the name of Schwinn of Chicago, about the first of November, 1911, and I furned over the keys to him

November the 11th, 1911.

Q. 107. When did you leave the employ of the Excelsior Company? A. About one week following turning over the keys to Mr. Schwinn.

Q. 108. Will you give your reasons for putting standard pistons back in the motor of this car after the

removal of the Exhibit 8 pistons? A. One of the reasons was that it was not a standard piston and could not be sold as such to any of Excelsior Motor Company's customers; another was in order that all motors were to be disposed of, and no others were to be manufactured by the Excelsior Company; further, as I, as the inventor of the idea, I considered it was of value, and as it was designed on my own time, it was my desire to hold it; further, I did not know what Schwinn's attitude might be in connection with the motor end of the industry.

Q. 109. Did you make any other sketches of slitted pistons than Exhibit I, prior to November, 1911? A. I

did not.

Q. 110. When did you conceive the idea as shown in Exhibits 1, 2 and 87 A. In the latter part of 1908.

By Mr. Kingsland: The answer of the witness is objected to and it is moved that it be striken out on the ground that it fails to conform to the preliminary statements. [57]

By Mr. Fletcher: The same objection.

Q. 111. Will you state just what particular construction you conceived in 1908, and state why you did not proceed with it at that time? A. In 1908 I was manufacturing automobiles with the Amplex Motor Car Company of Mishawaka, Indiana. We were building a two cycle motor, were having a great deal of trouble with pistons, owing to the fact that they were of large bore and being of two cycle construction, the pistons became very hot, caused considerable trouble from expansion, causing scoring, and when loose enough to operate properly, under these heat conditions were noisy, slappy. I conceived the idea of splitting these pistons the same as Exhibit 8, but upon investigation I found it would not work in a two cycle motor, as the port hole bridges were very narrow, and the diagonal slot would uncover the exhaust ports on the compression stroke and cause the charge which was compressed in the base of the motor to leak out. This made it impracticable with that particular motor. At about that time we were considering also the manufacture of a four cycle motor and it was my intestion to develop this piston for that purpose. However, as we did not enter the field of four cycle motors up until the time I left the Amplex Company in 1910 I had no chance to further carry out the idea until I became connected with the Excelsior Motor Manufacturing Company.

Q. 112. How were you engaged between November 1911 and the fall of 1913? A. I was in Syracuse, New York, through the early part of 1912, and back in Chicago in the fall of 1912. I was also back and forth between the east and Chicago up until the middle of 1913. I was engaged with one party by the name of Pulsifer in an attempt to organize an automobile company to take over the Amplex Motor Car Company of Mishawaka, which was about to go into the hands of a receiver. This effort, however, did not mature, and it was some time later before we were successful.

Q. 113. What, if anything, did you propose to do through the company which you were to organize with respect to your invention illustrated in Exhibits 1, 2 and 8? A. It was our intention to manufacture a [58] sleevevalve motor, which I had sketched up and to incorporate

in its construction pistons of a split sleeve type.

Q.114. How did the piston which you planned to install in these motors compare with that illustrated in Exhibit 17 A. It was practically the same as Exhibit 1, with the exception of possibly minor mechanical details.

Q. 115. Did you and Mr. Pulsifor finally succeed in

getting a plant? A. We did.

Q. 116. What plant, and when? A., We purchased the plant of the Amplex Motor Company, Mishawaka, Indiana, from the receiver, M. W. Mix, and took official possession shortly after the 1st of May, 1914.

Q. 117. What was the product of this plant at the time you took it over? A. Automobiles.

Q. 118. What kind of motor was used in these automobiles! A. We discontinued the use of the two cycle motor and was using six cylinders Buda four cycle motor.

Q. 119. What kind of pistons were used in these Buda motors? A. Standard gray iron pistons.

By Mr. Richey: I now produce a blue print which is marked for identification, Gulick's Exhibit No. 9.

Q. 120. What does this Exhibit 9 show? A. It shows a type of split piston as designed to use in the E. J. G. motor.

Q. 121.- Under whose instruction was the tracing of this print made! A. The original drawing was made under my instruction, and was carried out through Chief Engineer Winchester.

Q. 122. When was the original drawing made? A. Shortly after the—it was made prior to June, 1914.

Q. 123. Where was it made? A. Made at the plant of the Amplex Manufacturing Company, Mishawaka, Indiana.

Q. 124. Did you see it made? A. I saw the drawing as it was being made and when it was completed.

It had to pass my approval before being used.

Q. 125. What does the date 6-24-14 on the Exhibit 9 indicate, if anything? A. It means sixth month, twenty-fourth day, year of 1914. [59]

Q. 126. What does it indicate with respect to the completion of the original drawing? A. It means that that is the day the tracing was completed, but does not indicate the date which the paper drawing was made, as this record is supplied only when the tracing is made.

Q. 127. Whose initials are the letters B. E. R. on the bottom of this drawing? A. Bert E. Rockhoff, the man

who made the tracing.

Q. 128. Do you know the whereabouts of the original drawing or the tracing from which Exhibit 9 was

mader A. I do not.

Q. 129. Do you remember seeing the tracing? A. I saw both the tracing and the drawing prior to the making of the print. This tracing and drawing, with other drawings in connection with this motor, were in the files of the Amplex Motor Company, and they were taken over by the receiver, about November 1st, 1914, and as I had nothing to do with the business after that, do not know what became of them.

Q. 130. The original drawing and the tracing showed the same construction as Exhibit 9, didn't they?

A. They did.

Q. 131. When did you first come into the possession of the print, Exhibit 91 A. Shortly after it was made, in July, 1914. As I took copies of all prints made as fast as they were produced, as we were using some of the blue prints in connection with this sleeve motor for promotion purposes.

Q. 132. In whose handwriting is the matter in ink in the lower right hand corner? A. My handwriting.

Q. 133. Will you explain how the piston shown in the Exhibit 9 operated and what it did, or how it was proposed to operate? A. It was proposed to operate practically the same as the piston shown in Exhibit 1; however, the design in Exhibit 9 is mechanically very much

refined, and was designed as shown on Exhibit 9, to be

made of gray iron.

Q. 134. There is on the back of this tracing in rubber stamp, "Rec'd—by Buda-Drafting-Dept. Aug. 20 1915." Do you know how this stamp happened to be on there? A. I do.

Q.135. Will you explain how? A. I forwarded Exhibit 9 to the Buda Motor Company with the idea of [60] enlisting them in the manufacture or use of this piston in their motor, the date of which it was received by the Buda Motor Company, as indicated, was August 20, 1915. It must have been mailed at least two days prior to this.

Q. 136. There is written in your handwriting on the lower right hand corner of this drawing certain descriptive matter: when was that placed on Exhibit 9! A. This handwriting which is an explanation of the operation of the piston, was placed there shortly after my receiving Exhibit 9 in June, 1914, for the purpose of explaining to parties we were attempting to interest in the company its operation.

2. 137. Will you please read this descriptive matter

on the record? A.

"CROSS HEAD TYPE

Piston in which the Barrel is Split to provide for expansion and of which the Barrel is severed from the head and held by rib which carry the pin Bosses.

Design of Piston which automatically provide for Expansion and contraction without scoring or cutting and permits the piston being ground to practically the same size as cylinder Bore prevents all trouble in fitting and eliminates all piston pounding also wears cylinder more uniform.

It is ideal construction for aluminum pistons as expansion is taken care of without excessive clearance in fact practically no clearance other than a running fit is provided for. Same applies to Gray

/ Iron."

Q. 138. To whom, if anyone, was this descriptive matter disclosed? A. It was disclosed to a number of prospects we were trying to interest in financing the Amplex Manufacturing Company; also to the Buda Motor Company, Harvey, Illinois, and Packard Motor Car Company.

Q. 139. Did you disclose it to Mr. Milton Tibbetts of the Packard Company about March the 25th, 1916, at the same time you disclosed Exhibits 1 and 2 to him? A. I did.

Q. 140. Who put the B3 on Exhibit 9, if you know!
A. I do not know. [61]

Q. 141. Where was the print during the intervening period? A. It was in the prior to my turning it over to Packard, it was in the possession of the Buda Company for quite a period of time. I cannot recall the exact time, but it was necessary for me to write them for it on two occasions before it was returned. After it was returned it was in my possession until turned over to the Packard Motor Car Company, in March, 1916.

Q. 142. Did Mr. Pond or Mr. Offield see Exhibit 91

A. They did not.

Adjourn until 10:00 o'clock tomorrow morning.

South Bend, Indiana, July 22, 1926. Met pursuant to adjournment. Present, same as before:

Q. 143. Have you been able to think of anything else by which you can identify the time when Exhibit 1

was made by you! A. Yes.

Q. 144. Will you state it? A. In making up this sketch, it was the first time that I gave any personal attention to the mechanical features of a motorcycle motor, and as the development of these motors for racing purposes was going on, in sketching up Exhibit 1, I had in mind the general form of the motorcycle piston, and pictured the sketch about the same as the piston used in the motorcycle, that is, as to shape and dimensions. I never did any other work on a motorcycle except to follow it through until the time it was tested, which was some time prior to July, 1911.

some time prior to July, 1911.

Q. 145. At what ther time during your career, except the first part of 1911, did you work on any design relating to motorcycles? A. Never before, or never

after.

Q. 146. Who went with you to the Elgin races in the

summer of 1911? A. Morris Engle.

Q. 147. Did you attend the opening of the motor-drome in Chicago in July, 1911? A. I did.

By Mr. Richey: I offer in evidence as Gulick's Exhibit No. 9, the drawing so marked for identification.

By Mr. Kingsland: To the introduction in evidence of Exhibit No. 9 objection is made on the ground that it is not competent and has not been sufficiently proven.

[62]

By Mr. Richey: I produce a blue print and ask that it be marked by identification Gulick Exhibit

Q. 148. Will you look at Exhibit No. 10 and state what it shows? A. Exhibit No. 10 shows a sectional view of the E. J. G. motor.

Q. 149. What kind of a piston is shown in it? A. The same piston as shown and described in Exhibit 9.

Q. 150. I notice the piston in Exhibit 10 shows no. vertical slit; can you explain this! A. The piston shown in Exhibit 10 is shown in half-section and the fact that a small portion of the slot, that is the vertical slot, which would show in that section of the barrel of the piston, was merely an error in tracing.

Q. 151. Under whose direction was the original of Exhibit 10 made? A. It was authorized by me and made under the direction of an engineer by the name of Win-

chester.

Q. 152. Who made the original? A. Winchester.

Q. 153. When and where was the original made? A. It was made at the plant of the then Amplex Motor Car Company, in the early part of the year of 1914.

Q. 154. Did you see them working on this drawing

at that time? A. I did.
Q. 155. In the lower right-hand corner of Exhibit 10 there are the initials of F. U. W. Whose initials are these? A. Those are the initials of Winchester.

Q. 156. Where is the original of this Exhibit 10? A. The original and the tracing were with the were in the possession of the company when it was taken over by the receiver in November, 1914. I never saw them after that.

Q. 157. Do you know anything about the history of Exhibit 10 itself? A. It was in my possession untilafter the receivership, until I turned it over to the Packard Motor Car Company, in March, 1916.

Q. 158. That is, it was turned over to Mr. Tibbetts at the same time that you delivered to him Exhibits 1,

2 and 91 A. Yes.

Q. 159. When did Exhibit 10 first come into your possession! A. Prior to June, 1914.

By Mr. Richey: I offer in evidence as Gulick's Exhibit No. 10 the drawing which was so marked by identification.

By Mr. Kingsland: The offer in evidence of Exhibit No. 10 is objected to as incompetent and immaterial. It obviously does not show the subject matter of the counts of the interference.

By Mr. Fletcher: Same objection.

Q. 160. Were any of these split skirt pistons made by you or under your direction in 1914? A. Yes.

Q. 161. How many? A. Six were completed and

put in a motor.

Q. 162. Will you describe those pistons? You may refer to Exhibits 9 and 10 if you wish. A. The pistons referred to were similar to Exhibit 8, with the exception that there was two ribs extending from the head to the bosses, and that the slot was cut through and down to the ribs, completely around the piston below the lower ring, and the skirt was slotted diagonally.

By Mr. Richey: I ask that the sketch which I now produce be marked by identification, Gulick Ex-

hibit 11.

Q. 163. Will you compare the pistons which you say were made in 1914 with this drawing, Gulick Exhibit 11 A. They were the same construction as shown in Exhibit 11.

A. That was made November the 8th, 1922, by me.

Q. 165. Where and for what purpose was it made!

By Mr. Kingsland: The question is objected

by Mr. Kingsland: The question is objected to as immaterial, as it relates to a paper produced or made subsequent to the filing date of all parties involved in the interference, and can be nothing more than a self-serving paper.

A. It was made in Cleveland, Ohio, for the purpose of showing the construction of the six pistons which were placed in a six cylinder motor at the plant of the Amplex Manufacturing Company in 1914.

Q. 166. And it depicts your recollection of those pistons in 1922, does it not? A. It does. [64]

By Mr. Richey: I offer in evidence as Gulick's Exhibit 11 the drawing so marked for identification.

By Mr. Kingsland: The introduction in evidence of Exhibit No. 11 is objected to on the ground that it is incompetent and immaterial.

By Mr. Fletcher: The introduction in evidence of Exhibit No. 11 is objected to on the ground that

it is immaterial and therefore unwarranted, as it is subsequent to the filing date of the applications involved in these interferences.

Q. 167. Will you explain why the 1914 pistons were made like that illustrated in Exhibit 11 instead of that illustrated in Exhibits 9 and 10? A. The piston as made in Exhibit 11 was made from a standard piston pattern, and the only change was in the inserting of the double ribs, tying the bosses more securely to the piston head. The object in making these pistons was to give them a trial in aluminum, and not go to the expense of making up expensive patterne designed as shown in Exhibit 9. as these pistons were not to be used in the E. J. G. motor. They were installed for test purposes in a six cylinder Buda motor.

Q. 168. Who made the pistons? A. The castings. were made at the Rockhoff Foundry in Mishawaka. They were machined up in the plant of the Amplex Manufacturing Company, and were installed in a motor.

in this plant. Q. 169. Do you know who machined them? A. I

do not.

Q. 170. Did you see them at any time between the time they were cast and the time they were installed in the motor? A. I did.

Q. 171. How many times? A. More than once; I

don't know how many.

Q. 172. Had they been machined when you saw them? A. I saw them before they were machined, while they were being machined and after they were machined.

Q. 173. Who installed them in the motor? A. A man

by the name of Hoadley, I think.

Q. 174. Did you see them installed? A. I did not, but saw the pistons sitting on the floor beside the car [65] when he was preparing to make the installation, but was not present when he put them in.

Q. 175. What was done with the motor after the pistons were installed in it? A. The car was taken out on the road and ran for a period of time until they were

later removed.

Q. 176. How long, how far and at what speeds was the car run with these pistons in it? A. It was ran at various speeds up to sixty miles an hour, and at least a mileage of four thousand miles. It ran from about July until just prior to the receivership in November, 1914-

Q. 177. Do you remember any particular trip that you took with this car while these split pistons were in the motor? A. I took many trips: one to Chicago, and a number of times to various places in Indiana, on fishing trips.

Q. 178. What kind of a car was it? A. Amplex car. Q. 179. You drove it yourself, did you? A. I drove

it, and I owned it.

Q. 180. How do you fix the date when these pistons were installed in this car? A. I fix the date because it was in the summer of 1914 prior to the receivership.

Q. 181. That is, the Kamm peceivership? A. Yes. Q. 182. How did these Exhibit 11 pistons operate in the carf A. They operated perfectly up until just prior to the time at which they were removed. They were removed because the piston pins had pounded themselves loose in the piston bosses.

Q. 175. At what clearances were the Exhibit 11-pistons fitted in the cylinder walls? A. It would be impossible to state the exact clearance, but they were fitted just as close as they could be gotten into cylinders without driving them in; by this I mean, the fit was as close

at they could be forced in by hand.

Q. 176. Did you see the pistons then or after they were removed from the motor? A. I did.

Q. 177. What was their condition? A. They were in perfect condition as far as the exterior was concerned, the only defect being in the piston pin bosses.

Q. 178. No scoring or cutting? A. None whatever. Q. 179. The defect was not due to the slitting, was

1661 A. It was not. Q. 180. To what was it due? A. It was due to the fact that the piston pin bosses were too light, and also that the piston pins were not properly fitted.

Q. 181. Who removed the pistons from the motor!

A. I do not know.

Q. 182. Of what material were the pistons made!

A. Supposed to be a manganese aluminum.

Q. 183. Why do you say they were supposed to be manganese aluminum! A. Because manganese alumi num was being experimented with at that time for the purpose and Mr. Rockhoff advised that is what he u

Q. 184. As a result of your examining the pistons what kind of material would you say they were made of A. Dwould say aluminum without making an analysi

Q. 185. Did the pistons slap any while in use? A.

They did not

Q. 186. What became of these pistons! A. They were there until the time of the receivership; after that

I do not know what became of them.

Q. 187. How many people knew about the making and use of these 1914 Exhibit 11 pistons! A. There was not more than I should say ten employees in the factory, and would say that the only people who were really familiar with them were the people who did the machining and installing. The balance of the employee probably knew something about it.

Q. 188. You have spoken of the Kamm receivership; will you state when this occurred, and briefly the circumstances under which it occurred? A. The receivership took place in November, 1914, and was brought about by the inability of the Amplex Manufacturing

Company to retire a bond.

Q. 189. Will you state your reasons for not at that time making more pistons like the Exhibit 11 pistons?

A. The Amplex Manufacturing Company at the time these pistons were made were strictly engaged in disposing of automobiles made prior by the Amplex Motor Car Company. There were no Amplex motors for these cars, and in disposing of them they were equipped with standard Buda six cylinder motors, and it was not the intention of installing these pistors as shown in [67] Exhibit 11, to use them as regular product. It was merely for experimental and demonstrating purposes.

for experimental and demonstrating purposes.

Q. 190. I believe you said you were busy during the latter part of 1914 and the first part of 1915 in trying to get back the Amplex Company, and then become engaged in the—in your present employment, and that, in the meantime, in 1915, you had submitted your piston to the Buda Company and thereafter and in the first part of 1916 to the Packard Company; when was the deal by which your invention was assigned to the Packard Company consummated? A. I don't remember the date.

Q. 191. You had negotiations with Mr. Tibbetts, with Mr. Rector, with Mr. McCauley and various other people between March, 1916, and the consummation of the deal with the Packard Company, did you not? A. I

the deal with the Packard Company, did you not? A. I

did.

Q. 192. Will you state as near as you can recollect the date of each of these conferences, with whom the conferences were had, for what purpose they were held, and what was the result of the conferences? A. From the time I turned the various exhibits over to Mr. Tibbetts and until the time the deal was finally closed I had a number of conferences with—through Mr. Pond and with Messrs. Rector and McCauley. I was in and out of Chicago on these conferences at various times during the period, but cannot give the dates; and these conferences were in relation to the sale of the exhibits as well as various other patents. As some of these other patents were held by Kamm, the receiver, I was delayed considerable in rounding them up and in securing them for Packard Company. This delay, of course, held up the whole deal for a considerable period of time.

Q. 193. I now hand you a file of correspondence; will you state whether or not you wrote any of these letters? A. I wrote all letters bearing my signature.

Q. 194. The other papers are copies of letters addressed to you; did you receive such letters? A. I did.

By Mr. Richey: The letter dated March the 27th, 1916, corresponds to the copy referred to here-tofore as Gulick's Exhibit 3. The carbon copy is offered in evidence as Gulick's Exhibit 3. The [68] other letters are offered in evidence as Gulick's Exhibits 12, 13, 14, 15 and 16 respectively. They will further be identified by Mr. Tibbetts.

Q. 195. If these letters refresh your recollection as to any of the events which transpired during your negotiation for the sale of your piston invention to the Packard Company which you have not already related, will you refer to them and tell us about them! A. As I previously stated, in attempting to close the transaction with the Packard Company, a proposition was first made to them in which Exhibit 1, with the various other exhibits, were to be purchased. While these negotiations were pending a number of patents were in possession of Kamm, the receiver, which they wished to dispose of They approached me on the subject, and I advised the Packard Company I could secure a number of these old patents. However, when the time came for the Kammi to deliver there was two or three of the patents that they did not want to dispose of, which they had originally agreed to let me have. Not being able to deliver thes as per my statement to the Packard Company, after the proposition had been made covering the whole number of patents, it was necessary to revise the deal with the Packard Company. Even then the deal did not the go through as planned, owing to the fact that the Kammagain changed their mind as to the number of patents they were to turn over to me. This condition existed for some time, until the final settlement and turnover of the patents from the Kamm Company to me made it possible to close the deal.

Q. 196. Are the facts stated in these letters correct?

A. They are.

Q. 197. Was the twenty-nine hundred dollars referred to in Mr. Tibbetts' letter of March the 27th placed in Mr. Rector's hands for you in the spring of 1916, to be paid to you contingent upon your being able to deliver with a clear title the patents and inventions set forth in that letter! A. It was:

Q. 198. State whether or not you knew it, in the spring of 1916? A. I knew it, as I was so advised by Mr. Pond, that they were ready to take it over. [69]

Q. 199. Had you disclosed the piston shown in Exhibits 1, 2 and 9 to the Packard Company, or any of them, prior to March, 1916? A. I had.

Q. 200. Which one! A. Mr. Tibbetts.

Q. 201. Which one of the Exhibits 1, 2, or 9? A. I—prior to March I had not shown Mr. Tibbetts Exhibits 1, 2 or 9, but I had talked with Mr. Tibbetts about the split piston, and also the motor, as I was trying to interest him in taking them over. Shortly after or about the time at which I closed my suit with the Packard Company in 1915 I had lunch with Mr. Tibbetts in the Auditorium Hold, Chicago, and explained to him the piston and motor. At that time he was not particularly interested, but took it up with the Packard engineers, and later, about March 1916, we got together and that is the time that I turned over the Exhibits 1, 2, 9 and 10 to the Packard Company.

Q. 202. Had you, prior to March, 1916, sent a print like Exhibit 9 to the Packard Company! A. I might have done so; I do not know; if so, there would be some

correspondence evidencing same.

Q. 203. Can you tell from the letters when the deal

with the Packard Company was closed! A. No.

Q. 204. You were hired by Fred C. Robie to work for the Excelsior Company, were you not! A. I was.

Direct Examination Closed:

Choos Examination by Mr. Kingsland.

XQ. 205. Mr., Gulick; do you know who prepared the application upon which you are involved in this interference? A. Mr. Tibbetts. XQ. 206. Did you furnish him the date upon which the application was prepared? A. None other than has been shown in Exhibits 1 and 2.

XQ. 207. In addition to that, had you had any personal conferences with him before the application was prepared? A. Only such conferences as were had pend-

ing our negotiations.

XQ. 208. Do you recall, whether upon any of these conferences, you gave to Mr. Tibbetts any information relative to the subject matter of the invention that would supplement or add to the disclosures of Exhibits Nos. 1 and 21 A. I have no recollection of such [70] disclosures.

XQ. 209. Then so far as you now remember the only information relative to the invention of your application given to Mr. Tibbetts was the contents of Exhibits 1 and 2, is that correct? A. The contents of Exhibits 1 and 2 and 9.

XQ. 210. You desire, then, to correct your answer to XQ. 206 and add thereto Exhibit 9 as the extent of disclosure to Mr. Tibbetts, is that correct? A. Yes.

XQ. 211. To summarise the matter then, Mr. Tibbetts, so far as you now remember, had before him Exhibits 1, 2 and 9, without any further information or without any other disclosures when he prepared your application, is that correct? A. It is not correct. Mr. Tibbetts had in his possession at the time Exhibits 1, 2, 9 and 10, from which he undoubtedly prepared the application. However, during the preparation of this application, I did not have any conference with Mr. Tibbetts.

XQ. 212. I understand from your last answer that you now desire to supplement or change your answer to XQ. 210 by adding Exhibit 10 thereto, is that correct!

A. My first answer in reference to Exhibits 1 and 2 I was referring particularly to the written explanation in Exhibit 2 and not to all of the exhibits that were in his possession.

XQ. 213. Have you now stated all of the data that was before Mr. Tibbetts, so far as you now remember, at, before or during the preparation of your application?

Objection by Mr. Richey: Objected to as incompetent unless the witness was present when Mr. Tibbetts prepared the application.

A. All of the written data that I know of, written or printed data that I know of.

XQ.214. Do you know of any verbal data or information that Mr. Tibbetts had from you in addition to the written or printed data at the time stated in the last preceding question? A. None other than might have come up in verbal conversation before or at the time I turned the exhibits over to him.

XQ. 215. But I understand from your answer to XQ. 208 that you have no recollection of giving to Mr. Tibbetts any additional verbal information in [71] relation to the invention, is that correct? A. I have no recollection of having talked with Mr. Tibbets or seeing him after turning over the exhibits until he forwarded the application to me for my signature.

XQ. 216. Did you give to anyone connected with the Packard Company any verbal explanation in addition to the Exhibits that you have referred to in further or fuller explanation of the invention prior to the receipt of the application papers for your signature? A. I did not.

XQ. 217. Mr. Gulick, do you understand the subject matter of the counts involved in interference No. 49,569 and 49,570.

By Mr. Richey: Let the record show that counts have not been shown to the witness by examining counsel.

By Mr. Kingsland: The witness is privileged to examine the counts.

By Mr. Richey: We object to the question as incompetent; it is not the function of the witness to interpret the counts.

By Mr. Kingsland: The witness is produced apparently to establish his dates of invention, has made preliminary statements, and is assumed to be familiar with the subject matter of the invention.

familiar with the subject matter of the invention.

By Mr. Richey: We produced the witness to prove the facts he has testified about, and not to interpret the counts. That is the function of the tribunal who reviews this record.

A. Not having seen them before, and not understanding the terms in which they are set forth, I do not understand them.

XQ. 218. Will you refer to Exhibit No. 1 and indicate what you consider are the "means for joining the bosses and the cylinder engaging parts together," which is stated in the language Count 2 of interference number 49,569? A. In Exhibit 1, ribs 3 and 4 are the members which unite the bosses, skirt and the head.

XQ. 219. Will you please point to such language or other information contained in the Exhibits 1, 2, 9 and 10 that you have mentioned that characterize these means that you have just mentioned as resiliently yieldable.

A. The ribs or webs 3 and 4 and the skirt 2 are [73] yieldable to an extent sufficient to perform service for

which they are designed.

XQ. 220. Where is this information found in the exhibits that you have referred to? Namely, Exhibits 1, 2, 9 and 10. A. In Exhibit 1 it is shown by the ribs 3, 4 and the skirt 2; in Exhibit 9 it is shown in the ribs and skirt, the same as in Exhibit 1; in Exhibit 10 the same structure ribs are shown as in 1 and 9, the mechanical details, however, being more refined in 9 and 10 than in sketch Exhibit 1.

XQ. 221. Does your written description in Exhibit No. 2 give any information as to the yielding characteris-

ties of the ribs 3 and 41

Recess until 2:00 o'clock P. M.

By Mr. Richey: Notice is given that we will call as a witness Mr. Harvey Williamson of Elkhart, Indiana, who was referred to by Mr. Gulick.

A. It does. In paragraph 1, Exhibit 2, it reads, "Body 2, which provides bearing surface and which split as indicated by 7 to pr vide for expansion." And in paragraph 2 it feads, "Body 2 is machined as close to sides as is possible to make a fit, and any expansion is taken up by the slot 7." Were it not for the slot 7 the heating up of the body of the piston would expand it to such an extent, if fitted as close to the cylinder as is mentioned in Exhibit 2, and cause it to seize. The slot provides for the skirt to close up. In other words, the slot makes possible a degree of flexibility in the structure which would not exist were the body of the piston made solid. It is a well known fact that all metals are inherently flexible, and it is obvious that a piston of this structure dould not be otherwise than to a degree flexible. All pistons for engines when finished sixed, even though they are not split, are flexible. They cannot be contracted under their normal size at the temperature at which they are finished, but will expand beyond that size. However, they may be perfectly round, but can be taken in the hand and with a slight pressure, thrown out of round very few thousandths, which would evidence that all structures of this nature are to some degree flexible. However, this flexing does not provide for the amount of contraction necessary for a piston to run free if [73] fitted as close as would be fitted with a split skirt. I further refer to Exhibit 9, which reads, "Design of piston which automatically provides for expansion and contraction." Also reads, "which is ideal construction for aluminum piston, as expansion is taken care of without excessive clearance." Without the slot it would be impossible to fit the pistons as close as they may be fitted with the slots. Therefore it is obvious that a degree of flexibility sufficient to gare for the operating requirements exists, and which is one of the prime objects in the invention.

XQ. 222. When you say in your last answer that it is obvious that a degree of flexibility exists, does this necessarily mean that the flexibility exists in the ribs as well as in the skirts in pistons of the type shown in Exhibit 17 A. It does.

XQ. 223. Was it your intention to disclose in the application upon which you are involved in this interference the same invention as was disclosed in Exhibits 1, 2, 9 and 10? A. The application for invention I presume was drawn from these exhibits. I did not draw up the application and did not draw up the application and did not draw up the specifications. The disclosure in Exhibits 1, 2 and 9 fully cover the object of the invention.

XQ. 224. At the time you prepared Exhibit No. 2 did you know of the manner in which the ribs would flex as described by you in your answer to XQ. 2211 A. I did, from an engineering standpoint. I knew in which direction there was a standard to the contraction of the contraction o

direction they would flex.

XQ. 225. Did you consider the requirement that the ribs would flex in order to perform the objects and function of the structure shown in Exhibit 1 was essential?

Objection by Mr. Richey: In asking the witness for his opinion counsel makes the witness his own.

By Mr. Kingsland: The witness has on direct examination presumed to express opinions as to the functioning of the device and the examination in relation to the functioning is entirely proper as purely cross examination.

A. I knew of necessity the ribs would have to flex in some degree to permit of the skirt closing.

XQ. 226. What explanation have you for failing to directly mention the flexible characteristic of the rib [74]

when you prepared Exhibit 2? A. I did not consider that it was necessary to attempt to patent an ordinary piece of material, east iron or aluminum, inasmuch as the material used in these structures was inherently flexible. I further did not know it was possible to patent an inherently flexible metal or material, as far as the flexible feature is concerned. The construction of these pistons, and the slotting, automatically provides, in connection with the flexibility of the material, for the difference in degree of expansion.

XQ. 227. Do you consider it essential, and did you so consider it at the time you prepared Exhibits 1 and 2, that the skirt should be slotted in order to carry out the

objects of the invention? A. Yes.

XQ. 228. Do you recall the circumstance of the execution of the application by you upon which you are involved in this interference? A. I do. But I do not/recall the readings in the application exactly, but do know what they purport to express. These application papers were only in my possession for my signature, mailed to me from Detroit from the Packard Motor Car Company and were returned to them. I have never seen them since, or a copy.

XQ. 229. Did you read the specification and examine the drawing before you signed it? A. Yes, I read it. But I do not recall now how it read; or, in other words,

the wording of the application.

XQ. 230. At the time you signed it did it express, in your opinion, the accurate disclosure of the invention?

A. Yes.

XQ. 231. Referring to Exhibit 1, what elements designating them by the number used on the exhibit, forms the connection between the piston pin bosses and the skirt of the piston? A. Ribs 3 and 4.

XQ. 232. What do you understand the word "rigid"

to mean?

By Mr. Richey: This line of examination is not germane to the direct examination and counsel makes the witness his own; moreover, the witness is being asked to interpret the claims and specifications which is the function of the patent office, and objection is made to the question on that ground also. [75]

By Mr. Kingsland: The witness has testified that the specification expressed an accurate disclosure of the invention. Obviously counsel has a right to inquire as to the witness' understanding of the

use of language in the specification.

A. Rigid, absolutely immovable, absolute inability to flex.

XQ. 233. I will now ask you to consider the language appearing in the third paragraph of page four of your original specification that reads as follows:

"It will be seen that in addition to providing a piston with a split skirt, the above described construction also provides an extremely rigid connection between the piston pin bosses and the skirt of the piston, which construction may be used either with or without the split skirt and separated head."

Do you consider that the above language accurately describes or discloses the invention as shown in your Exhibit No. 1 and described in your Exhibit No. 21 (Counsel hands witness certified copy of the Gulick file-wrapper contents which witness examines.) A. It does describe the invention and the fact that the ribs are mentioned as rigid between the piston pin bosses and the skirt does not detract from the flexible feature, owing to the fact that it was quite necessary that a rigid structure or as near so as possible be incorporated in the direct line of thrust sidewise for the connecting rods. The ribs in connection with the piston and the bosses and as attached to the head when the piston was flexed or closed at the slot would flex more or less between the head and the bosses. The skirt body would flex between the ribs, permitting it to close at the slot, and the ribs would close in; they would not flex to any perceptible degree lengthwise of the rib across the piston.

XQ. 234. I will now ask you to examine the entire original specification and point out such language there in as you consider justifies the theory of operation given in your last answer. A. I will not attempt to interpret the language of the specification. However, I see nothing in this specification that does not describe the invention and its relations to a split piston providing for expansion and contraction.

pansion and contraction.

XQ. 235. In answer to XQ. 227 you said that you considered the slotting of the skirt an assential in order to carry out the objects of the invention. In the language that L'quoted in XQ. 232 it was stated that the structure may be used either with or without the split skirt. Did you consider it accurate to set forth in the specification that an operative structure could be made to accomplish the object of the invention without a split

in the skirt? A. The structure shown, that is, the interior ribs, could be incorporated in the piston without the split skirt. However, in such case it would not be flexible. With the split skirt, the structure becomes flexible as shown in Exhibit 1 and as expressed in the

application.

XQ 236. Has the thickness of the ribs anything to do with the flexibility thereof, I am referring of course to a piston such as shown in Exhibit No. 1? A. The thickness of the ribs would have some bearing on the degree of flexibility; by that I mean, the thinner the section of rib the less would be the tension, and the thicker the rib the higher would be the tension and less

susceptible to easier degrees of flexibility.

XQ. 237. If the metal of the ribs were made of such a thickness that the cylinder wall pressure failed to overcome the rib tension would the piston seize! A. If it were a rib sufficiently heavy that there was absolutely no flexibility in a direction parallel to the piston head, the structure would then be in that direction rigid, and if fitted to the cylinder as closely as permitted by the flexible structure as in the application, it would undoubtedly score on the sides adjacent to the end of the piston pins. However, the split in the skirt between the ribs would afford relief for that portion of the skirt, but could not afford relief for the sides of the piston adjacent to the pin, and by this explanation I mean a rigid structure parallel with the piston pin.

XQ. 238. When you talked with your wife about this matter did you explain to her the fact that the ribs would be flexible, or did you stop short of that full explanation? A. I explained to her fully that the structure of the skirt and ribs below the head were of a flexible nature.

XQ. 239. But you failed to make this explanation, so far as you remember, as I understand your testimony to Mr. Tibbetts or anyone connected with the Packard Motor Car Company, is that correct? A. I cannot say that I mentioned the word "flexible" in connection with this design to Mr. Tibbetts. I do not know. However, it might have been mentioned in some of our talks prior to my making the deal with them and turning over the papers. I did not mention it to anyone else connected with the Packard Company. The structure in itself evidences its flexible nature.

XQ. 240. On your direct examination you stated that you made the first set of pistons following Exhibit No. 1 for a motorcycle motor. Did those pistons vary in any detail from the showing of the Exhibit No. 17

A. They did.

XQ. 241. Please describe the differences between the showing of Exhibit No. 1 and the pistons that you made for the motorcycle motor. A. The pistons used in the motorcycle motor were constructed the same as Exhibit No. 8, and were made from a standard Excelsion motorcycle piston.

XQ. 242. They had no flexible ribs connecting the bosses with the head and the bosses with the skirt, had they? A. No, the flexation was entirely in the skirt.

XQ. 243. When you answered Q. 20 you stated that you made a set of pistons of Exhibit No. 1. In view of your last answer do you consider your answer to Q. 20 accurate and a fair statement of the facts? A. The answer to Q. 20 is an error. This is the correct answer to Q. 20: None other except that we made a set of split pistons for a motorcycle motor which was block tested to be used in a racing motor prior to the official opening; further, the pistons used in this test were of the standard racing type and were split to develop the split skirt idea, but were not ribbed exactly as shown in the sketch.

XQ. 244. Was it your custom to date sketches of

inventions devised by you prior to 1911 A. It was. XQ. 245. Did you have any reason for omitting the date on Exhibit No. 17 A. None whatever. The [78] specifications, however, Exhibit 2, I had not quite completed, and it is probably the reason why the date was not affixed.

XQ. 246. In your answer to Q. 34 you mentioned a suit against the Packard Motor Car Company. What was the general nature of that suit, and where was it pending? A. It was a suit against the Packard Motor Car Company for royalties on rear axle structures and the suit was filed in Chicago.

XQ. 247. In your conferences relating to the transfer of your inventions to the Packard Company, did you confer with anybody connected with that company other than Mr. Tibbetts? A No one directly connected with

the company but Mr. Tibbetts.

XQ. 248. During the prosecution of the application upon which you are involved in this interference, after

it was filed, did you confer with Mr. Tibbetts concerning the subject? A. I have no recollection of any correspondence or any consultation on the subject after it was filed. However, he may have brought up some question, and not having preserved Tibbetts' letters, I do not know.

XQ. 249. Did you authorize any amendments in the case after it was filed? A. I do not know that I did.

That is, I don't remember.

XQ. 250. Did you have anything to do with the transfer of the application from the Packard Company

to the present owner? A. I did not.

XQ. 251. When did you first learn that claims in the case were directed to the flexible feature of the rib!

A. I don't know that the question of the particular flexibility of the ribs was brought up until this deposition was being taken.

XQ. 252. Before that time you did not consider the particular flexibility of the ribs as part of your invention, as I understand it, is that correct? A. I did not consider the word "flexible ribs" inasmuch as the general structure shown in the application shows—indicates

a flexible structure in relation to the split skirt.

XQ. 253. In answer to XQ. 226 you stated that you did not think it possible to patent an inherently flexible metal or material, was this the reason that you did not mention to Mr. Tibbetts the flexible characteristics [79] of the ribs? A. I think Mr. Tibbetts was as well aware of the flexible nature of the structure as I was, and I do not think that it occurred to him or anyone else to attempt to cover an inherently flexible material. The structure in itself provides all the necessary flexibility.

XQ. 254. Were you of the opinion in 1922 that the flexible characteristic of the rib was merely an inherent quality of the metal out of which they were made? A. I was always of the opinion that the design of the structure in connection with the flexibility of the material was all that was necessary to produce a proper working platon. It is necessary that the material be flexible; if not, when the piston skirt was closed it would stay in that position and be of no further use. It must be flexible to conform to the uses to which it was put.

XQ. 255. Did you at any time during the prosecution of the application examine any of the amendments

that were filed? A. I do not know that I did.

XQ. 256. Will you say that you did not? A. I will not state that I did not or that I did. I do not know.

XQ. 257. I refresh your memory by prerring you to a photostat of a supplemental oath filed as a part of your application and dated November 8, 1922, and will ask you whether this recalls any circumstances connected with the prosecution of the case? A. It recalls no circumstances, but I did execute the supplemental oath. However, it had slipped my mind, having no record that I did soc

XQ. 258. In this oath you state that you had read the application as it stands amended after the filing of the amendatory paper filed September 11, 1922. Do you recall any circumstance of reading the amended application? A. None except that I probably read it over and signed it and returned it.

XQ. 259. In your last answer, when you say "it"

do you mean your supplemental oath? A. Yes.

XQ. 260. You have no independent memory of examining any other papers at that time? A. No.

End of Cross Examination by Mr. Kingsland.

It is agreed by all the parties that the balance of Mr. Gulick's testimony may be taken stenographically by Mr. Batson and written up by him.

Choss Examination by Mr. Fletcher.

XQ. 261. In your answer to Q. 13 you have stated that in addition to showing and exhibiting Exhibit No. 1 to your wife, you also disclosed it to one or two other. parties. Do you now recall who the other parties were! A. They were friends of mine who lived in the immediate neighborhood.

XQ. 262. Can you give their names? A. I can give their names, but it don't seem to be warranted; the idea

is, two of them were women.

XQ. 263. What are their names? A. One was Mrs. Smith and the other, Mrs. Grubb. Their husbands also visited my house on numerous occasions and knew of it, but not sufficiently familiar with it to be able to testify. XQ. 264. Two of them—both of them? A. Yes. XQ. 265. Did you disclose Exhibit No. 1 to the hus-

bands of these women? A. I believe I did, yes. XQ. 266. Prior to 1911 was it customary with you to have sketches and the like which you disclosed to others attested or witnessed by such others? A. Some-

times I did and sometimes I did not.

XQ. 267. Is Exhibit No. 1 the basis used in the preparation of your application for letters patent, and in which application the counts of the interferences are involved?

By Mr. Richey: Objected to as incompetent; the application itself is the best evidence.

A. It is probable that Exhibit 1 and Exhibit 9 were

used in the preparation of the application.

XQ. 268. Was Exhibit No. 2 used in the preparation of the application? A. I don't know; but I expect it was.

XQ. 269. In the last paragraph of Exhibit No. 2 it

is stated:

"The head, 1, is machined small enough to allow for expansion and not bind or seize, while the body, 2, is machined as close to size as is possible."

Do you recall whether this statement was made in your application filed in November, 1917? [81]

By Mr. Richey: Objected to; the application itself is the best evidence.

A. I do not know

XQ. 270. At the time that the Excelsior Company was preparing for the races at the motordrome at Chicago and you were making a piston to go into the motorcycle motors to be used in the races, what type of a piston were you working on at that time? A. It was a standard type motorcycle piston, split the same as Exhibit 8, practically the same as Exhibit 8.

XQ. 271. Where were the pin bosses disposed in the piston like Exhibit 8! A. In about the same position below the ring head as in Exhibit 8, in the same position.

XQ. 272. Then they were extended from the skirt of the piston? A. They extended inwardly from the skirt of the piston.

XQ. 273. In your answer to Q. 20 you stated in part: "Were not ribbed exactly as shown in this

sketch."

The Witness: In "the" sketch or in "this" sketch?

Mr. Fletcher: This sketch.

XQ. 274. Where were these ribs disposed and how, with respect to the piston, Exhibit No. 81 A. There was one small rib extending from the head down to the piston pin boss, and two very slight projecting ribs extending partially around the piston from the pin bosses.

XQ. 275. Were there any ribs extending transversely from the pin bosses to the skirt? A. No. Now, I don't know what you call transversely in this case. Look at it yourself. That is an entirely different thing. That

doesn't extend down.

XQ. 276. I mean transversely, something like that

—that is not Exhibit 8, is it? A. No.

By Mr. Richey: It is requested that the piston produced by the witness and referred to in the preceding answer be marked for identification, Gulick Exhibit 17; and it is so marked. [82]

XQ. 277. My previous question was directed to Exhibit No. 8. Were there any ribs extending transversely from the pin bosses of Exhibit No. 8? A. Not like the ribs shown in Exhibit 1. Exhibit 17 shows the interior

construction of the ribe.

XQ. 278. When was the first time you made a piston like the disclosure of Exhibit 1f A. First piston made of practically the same structure as in Exhibit 1 was—patterns were made from Exhibit—patterns and castings were made from Exhibit 9. The piston, however, never was machined or finished. In the year of 1914.

XQ. 279. With respect to the type of piston you have described as the Renault, Exhibit No. 8, as you have stated that some of them were put in a motor and used in the motor races at Elgin, Illinois was the motor races well patronized? A. They were.

XQ. 280. Were you there from day to day! A. I

was there one day.

XQ. 281. Then you only speak of the races being patronized for one day? A. That is all. The day on which I was there with the Renault. The Renault, however, was not driven in the races; it was driven to the races, to visit the races, from Chicago, and return, in one day.

XQ. 282. How far did you state that these Renault pistons like the Exhibit No. 8 were operated as to mileage of an automobile driven by the motor in which the pistons were mounted? A. Why, I believe I said some-

thing around possibly three or four thousand miles; I don't just remember. It was driven fully that much; might have been more.

XQ. 283. The longest trip that you took was that in which Mr. Williamson was along, was it not? A. It

was the longest single trip.

XQ. 284. In your answer to Q. 110 you stated, "in the latter part of 1908," with reference to conceiving the idea in Exhibits 1, 2 and 8. Can you further state, in more detail, as to what the idea wast A. The idea was to simply split the skirt, practically the same as [83] shown in Exhibit 8. But it wasn't practical to use in a two cycle motor, and was not used because we didn't build four cycles.

XQ. 285. Were all of your ideas on splits at that time the same as that shown in Exhibit 8, in which the diagonal slot extends into the transverse slot? A. That

was the general idea of the split construction.

XQ. 286. "Was this your car that the pistons of the type Exhibit 8 were mounted in at the time of the Elgin races? A. It was not.

XQ. 287. Who did the car belong to? A. Belonged

to the Excelsior Motor Manufacturing Company.

XQ. 288. What type of a car was it—touring or closed carf A. Five passenger open touring type car, Renault type of design.

XQ. 289. Was the car used in connection with the

Excelsior Company's business? A. It was.

XQ. 290. How long did you say that the car was used at the time that the motor had the pistons of the type shown in Exhibit 81 A. From just prior—the day prior-from the day of the Elgin races, until shortly after the first of October in 1911.

XQ. 291) How many pistons did you make of the type shown in the sketch, Exhibit No. 117 A. There was possibly fifteen or eighteen castings made of this type before we succeeded in getting enough sound ones

to make six good pistons, and one extra.

XQ. 292. When were those pistons cert? A. Well, they were cast prior—these were cast, I should say about July, 1914; along about the first of July, 1914.

XQ. 293. And those that were machined, were they machined shortly thereafter? A. They were machined as fast as they were cast until we got enough good ones. Exhibit 11, however, is not a drawing of the piston; it is merely a sketch showing the type of construction.

XQ. 294. Did you have another drawing of the piston? A. No drawing was ever made of the piston.

XQ. 245. Then Exhibit 11 was the first sketch or drawing made, is that correct? A. No. There was a sketch made of the bosses and how they were to be incorporated in a piston pattern which was either [84] owned by the Amplex Motor Car Company or by the Rockhoff Foundry. There was no drawing made of the piston, as it was a standard type; merely a sketch of the bosses and how they were to be placed in the piston, the machining of the rings and so forth. Overall dimensions and otherwise were copied from a Buda piston, and the slotting was done by merely an explanation as to how they were to be slotted.

XQ. 246. When was this sketch which you have just mentioned made? A. Oh, it was made probably sometime in June, the latter part of June, 1914, about the time the pattern was fixed up and the castings made; only possibly two or three days was required to do the whole job.

XQ. 247. Was the Buda piston which you have just mentioned slotted? A. It was not.

XQ. 248. In Interference No. 49571, count one thereof, it states in part:

"A tying means extending from each of said wrist pin bearings, each being cooperably connected at their opposite ends to said cylinder engaging portion."

Can you describe this construction on Exhibit 1?

By Mr. Richey: Objected to as not germane to the direct examination, and as asking the witness to execute the function of the patent office.

A. On Exhibit 1 it would be shown as ribs 3 and 4,

tying the pin bosses to the skirt of the piston.

XQ. 249. Can you describe what is meant by the cooperable connection of the tying means with the skirt, with respect to Exhibit 17

By Mr. Richey: Same objection; counsel makes the witness his own.

A. I hardly know how to express this cooperable connection, unless it was where the rib was connected to the skirt of the piston, and independently, each rib being independent of the other rib.

Adjournment at 5 o'clock until 9:30 o'clock to morrow morning. [85]

Friday, July 23, 1926; 9:30 o'clock A. M. Deposition resumed.

XQ. 250. By your answer to Q. 23, I take it, then, that you never made a piston like that disclosed in Exhibit No. 1 at that time, is that correct. A. We made the piston patterns and the castings, but we never machined them up.

XQ. 251. But the time you have reference to in your answer to Q. 23 is the year 1911? A. Yes; that answer to Q. 23 is 1911. But, now, in this one back of this, was that referring to Exhibit 1 or Exhibit 9?

XQ. 252. Exhibit 1. A. I want to get back to that

question then.

The notary reads XQ. 250.

A. I never made a piston in 1911 like Exhibit 1, as far as the rib structure is concerned. The piston made in '11 and referred to in Q. 23 was a standard type slot-

ted, the same as Exhibit 8.

XQ. 253. In your answer to Q. 42 you stated that you did not recall showing Exhibit 2 to anyone but your wife prior to showing Exhibit 2 to Mr. Offield, whereas in answer to and XQ. you stated that you showed it to two other parties. Which of these answers is correct? A. In showing it to my wife, she was the only one that was familiar, by my explanation, with its construction. The other parties mentioned, being neighbors, saw it, as previously stated, but were not qualified to understand it. For that reason, in my first answer I did not mention them. I had forgotten the circumstances.

XQ. 254. In your answer to Q. 73 you stated with reference to Exhibit 8 that they were made in 1911. Was this the first time you made a piston having a slotting

of the character shown in Exhibit 8? A. No.

XQ. 255. When was the first time you made a slotting of the character shown in Exhibit 8† A. The motorcycle piston that was made in 1911 was slotted prior to Exhibit 8.

XQ. 256. How much prior to the slotting of Exhibit

8† A. I don't know the exact number of days.

XQ. 257. In your answer to Q. 73 you stated it was in July, 1911, that pistons like Exhibit 8 were made. [86] Does this refresh your memory as to when others were made prior to this date? A. Exhibit 8 was made in

July, and the motorcycle piston of similar construction was made earlier; was made before Exhibit 8.

XQ. 258. But it was in 1911, wasn't it? A. It was

in 1911.

XQ. 259. Which of the original drawings of Exhibits 9 and 10 were made first? A. Ten was made first.

XQ. 260. As I understand it, the original drawings of Exhibits 9 and 10 were made after you and Mr. Pulsifer took over the Amplex Company from the receiver, is that correct? A. The drawings were started prior to our taking over the Amplex plant, as negotiations were not completed until about May, 1914, and draftsmen were working on this type prior to the closing of the negotiations.

XQ. 261. Where were the original drawings made of Exhibits 9 and 10? A. Made in the plant of the Amplex—They were started in the plant of the Amplex Motor Car Company, Mishawaka, Indiana, and finished in the plant of the Amplex Manufacturing Company,

same place.

By Mr. Richey: Same plant? The Witness: Same plant, in 1914.

XQ. 262. After the receivership of the Amplex Motor Car Company in 1914 you have stated that you sent Exhibit 9 to the Buda Company, and that later you corresponded with the Buda Company for the return of Exhibit 9. Have you any of the correspondence had between you and the Buda Company with respect to the return of Exhibit 9? A. I have not.

XQ. 263. Did you have any correspondence with them—that is, letters from the Buda Company? A. I

did at the time.

XQ. 264. Then you do not know where said letters are, do you? A. I haven't the letters in my files. I presume, however, the Buda Company has copies of their replies to me, and possibly my letters.

By Mr. Richey: You searched for your files,

did you?

By the Witness: I haven't any. Exhibit 9 indicates that the Buda Company received the [87] print, as it is stamped on the back, the date which they received it.

XQ. 265. In count 3 of Interference No. 49571 part of the language thereof reads as follows:

"And the skirt portion being split longitudinally of the piston to permit free expansion and contraction."

Can you, by referring to Exhibit 1, point out the elements that would permit the expansion and contraction of the skirt portion?

By Mr. Richey: In asking the witness to interpret the claims, counsel makes the witness his own.

A. Ribs 3 and 4 would flex or give to some extent above the piston pin in the narrow section shown in A which connects the bosses and the head. The skirt body, 2, would flex at the back side opposite the slot. Ribs 3 and 4 would also flex slightly. And the whole structure lends itself and adapts itself to a degree of flexibility. It was designed for that purpose.

XQ. 266. You have mentioned the ribs 3 and 4 which lead to the body portion or skirt 2, said ribs obviously forming a support to the skirt. Would not such connection of the ribs 3 and 4 to the skirt provide a reinforcement to the skirt? A. They would provide a rein-

forcement, but not a rigid reinforcement.

XQ. 267. But would they permit the skirt to be free! That is, so as to have free expansion, such as unrestrained expansion.

By Mr. Richey: Will counsel explain to the witness what he means by "unrestrained"?

By Mr. Fletcher: "Unrestrained!" means where

a part is free to act without being held back.

By Mr. Richey: The question is objected to as immaterial.

A. If the structure was of such a nature that it would expand or contract and not react it would be of. no value.

Mr. Fletcher: That is all.

[88]

RE-DIRECT EXAMINATION by Mr. Richey.

RQ. 268. During your cross examination you referred to the motor piston marked Exhibit 17. When did this piston come into your possession? A. I never

saw this piston until yesterday, July 22nd. RQ. 269. Day before yesterday Mr. McCoy wired for the piston and the blue print which I hand you and which I have marked by identification No. 18, did he not, and they were received yesterday noon? A. That is

what I understand.

RQ. 270. The type of piston exemplified by 17 and illustrated by 18 is a type of motorcycle piston that the Excelsior Company was using in the first part of 1911, aren't they! A.

RQ. 271. About the time you made Exhibits 1 and

A. Yes.
RQ. 272. How do the proportions of the piston illustrated in Exhibit 1 compare with the proportions of Exhibit 17 and the piston illustrated in Exhibit 18? A. The overall dimensions are very close.

RQ. 273. That is, the actual dimensions or the proportions? A. The actual outside dimensions and gen-

eral proportions, not considering the rib structure.

RQ. 274. I believe you stated it was your intention that the piston which you illustrate in Exhibit 1 was to be used in substitution for pistons like 17, and that illustrated in 18, is that correct? A. That is right.

RQ. 275. Now, you also said, I think, that it was pistons like Exhibit 17 that were modified by slotting

them in 1911—that is correct? A. Yes.

RQ. 276. Will you mark on this piston, Exhibit 17, and on the drawing, Exhibit 18, how those pistons were modified?

(The witness marks said Exhibits with red pencil.)

A. That is close enough to show it, isn't it? I

have so marked them with red pencil.

RQ. 277. At the bottom of Exhibit 9, below, the illustration of the piston, is the word "cast iron," and during the description it is stated that this is an ideal construction for aluminum. If the piston illustrated in [89]. Exhibit 9 was made of cast iron or aluminum state whether or not the webs would be flexible and yieldable.

A. They would.

RQ. 278. During your cross examination by Mr. Kingsland you were interrogated regarding your application. Will you look at the drawing of this application and state what would happen to the webs shown therein if the piston expanded? A. When the piston expanded naturally the circumference of the skirt would increase and the webs would flex slightly to meet these requirements.

RQ. 279. I call your attention to the statement at the bottom of page 3 of the specification, as follows:-

"In order that the skirt may not expand an undue amount when the piston is heated, as under operating conditions, it is split longitudinally as at 21."

What would happen to the webs when the piston operated as described in the quotation which I have read from the specification? A. As soon as the skirt had expanded a sufficient amount to take up any clearance which might exist between the cylinder walls and the skirt, then the material would flex, then the structure would flex and the split would absorb the surplus expansion.

RQ.280. By "structure" you mean the webs! A. Webs and the whole structure in connection with the

skirt.

By Mr. Kingsland: Last question and answer objected to on the ground that it is leading, and move that it be stricken out.

RQ. 281. The specification further says that one of the objects of the present invention, "is to provide a piston which will not expand against the cylinder wall to such an extent as to seize or stick."

"Another object of the invention is to provide a piston with a skirt or guide portion slightly separated from the head of the piston and split lengitudinally so that it will not expand in circumference with force great enough to cause the piston to stick in the cylinder." [90]

What would happen to the webs of the piston illustrated in the drawing of your application if it operated and realized these objects. A. As soon as the skirt had expanded to the cylinder walls as far as it could go the balance of the expansion would be taken up by the slot and necessarily the ribs would flex slightly between the head and the piston pin bosses; and also the ribs extending crosswise would flex to a very slight extent, sufficient to make the device operative.

RQ. 282. When Mr. Kingsland called your attention to the supplemental oath I think you didn't note that the same had been executed in Cuyahoga County, Ohio. Will you look at this oath now and state whether or not that fact refreshes your recollection as to the execution of the same or the consideration of the amendatory paper filed September 11, 1922? A. I. at the time of answering the question, did not recall having signed this paper, this amendment. However, when it

was brought to my attention, I did sign it in Cleveland, and I read it before I signed it or I never would put my signature to it, as I am not in the habit of signing any papers or attaching my signature until I read them. I signed this paper in Cleveland on November the 8th, 1922 the day on which I made sketch Exhibit 11, which was the only time I have been in Cleveland on this subject matter. I didn't give this subject much attention, outside of reading it over, as I was not so much interested in it as I was in the earlier developments of the piston. I had forgotten the circumstances,

RQ. 283. The Exhibit 9 refers to the E. J. G. motor. State whether or not that was adopted as standard equipment by anybody. A. It was adopted by the Amplex Manufacturing Company as standard equipment, and

was intended to be used with the Amplex cars.
RQ. 284. And as standard ment it was to include the piston shown in Exhibit 9, which you state was a part of it? A. It was.

RQ. 285. State whether or not patterns were made to make castings for the pistons shown in Exhibit 9. A.

They were.

RQ. 286. When were they made, do you know? A. Castings were made in the—they were made after July, and a short time prior to the receivership. I just can't state thr. date.

RQ. 287. Do you know who made them? A. I do

RQ. 288. Were any castings made from those pat-

terns? A. There was.

RQ. 289. How many? A. Well, it was a six cylinder motor and there was some surplus castings made. I don't know just how many.

RQ. 290. Do you know who made them? A. I do

not.

RQ. 291. Who made the patterns? A. The patterns. were made in South Bend, were made here, by either the South Bend Pattern Works or the Peerless Pattern Company.

RQ. 292. When were the castings made? A. They were made sometime after July and prior to the receiver-

ship in November.

RQ. 293. What was done to the castings? A. Nothing. They were received at the factory but were never machined.

RQ. 294. Why not? A. Because of the receivership.

RQ. 295. Where are the castings now? A. I don't know.

RQ. 296. What was the purpose in making them?

A. To put them in the motor, in the E. J. G. motor.

RQ. 297. To machine them up and put them in the E. J. G. motor? A. Yes, to machine them up and put

them in the E. J. G. motor.

RQ. 298. You testified about your efforts to recover your company from the Kamm receivership. Will you state more in detail what you did after the receivership in November, 1914, in an effort to recover the company. A. Shortly after the receivership in November, 1914, Mr. Pulsifer and I were engaged in attempting to take it out of the hands of the receivership. Mr. Pulsifer consulted some attorneys in Chicago, and I consulted Mr. Graham of South Bend on the subject. We had no way of forcing them to accept our terms, and we attempted to raise enough money to buy it back, but times at that time, money was rather close and investors were not very fast in lining up with such a proposition. We worked on the subject and made ovations to Kamm, the receiver, and we visited him on several occasions up [92] until about April, 1915, and as we didn't succeed in getting anywhere, he finally advised us that he was going to operate the business, at least temporarily, which he We then ceased our attempts to finance it. And that was the end of it, as far as we were concerned.

RQ. 299. State whether or not you used any pasteboard in making the patterns for the pistons shown in

Exhibit 11, and if so, how.

By Mr. Kingsland: This line of examination is objected to as clearly improper redirect examination; the last several questions have covered matters that should have been brought out in direct, if at all,

A. Pasteboard was wrapped around the patterns to increase their size sufficient to machine, as the original pattern was slightly smaller than the bore of the Buds motor.

RQ. 300. You were asked during your cross examination about the piston of the patent application. I show you a piston which I mark for identification Exhibit 19. Will you state whether or not in your opinion this is a fair representation of what is shown in the patent application drawing and what is described in the application. A. It is.

RQ. 301. State whether or not that is in your opinion a fair representation of what you disclosed to Mr. Tibbetts. A. It is.

RQ. 302. State whether or not it is a fair represen-

tation of what is disclosed in Exhibit 9. A. It is,

RQ. 303. You were asked during your cross examination about that trip you and Mr. Williamson took. I show you a photograph which I have marked for identification, Exhibit 20. Will you state what this shows? A. This is a picture of the Renault type car which was owned by the Excelsior Motor Company and which was fitted with split type pistons. This picture was taken on the road when we were near Michigan City on a trip which Mr. and Mrs. Williamson and my wife and I made to Mishawaka in the latter part of September, 1911.

RQ. 304. Who were the people in the car, as shown in this picture? A. My wife in the front seat, Mrs. Williamson in the rear seat. The one on the left is my wife and the one on the right is Mrs. Williamson. [93]

RQ. 305. Have you read the counts of this interference and do you understand the same? A. I have and I do.

RQ. 306. Are you the inventor of the subject matter of the counts?

By Mr. Kingsland: The question is objected to as incompetent and calling for a conclusion of the witness.

By Mr. Fletcher: The same objection.

A. I am.

RQ. 307. Are you financially interested in the outcome of this controversy or any of them? A. I am not.

RQ. 308. I show you some drawings marked Exhibits A2 and A8 which I will have marked for identification, Gulick's Exhibit 21 and Gulick's Exhibit 22 respectively. What do these drawings show? A. These are right and left hand views of the E. J. G. motor and the same motor as shown in section in Exhibit 10. The prints might be somewhat confusing as both views were made from the original tracing, but it will be noted that the pump is shown as on one side and the magneto on the other.

RQ. 309. That is the motor that is referred to in

Exhibit 9, ian't it? A. Same motor.

RQ. 310. When were those prints, Exhibits 21 and 22, made? A. Early part of 1914.

RQ. 311. You were asked during your cross examination regarding the Amplex car which you had in 1914. Did you look last night at your home for a bill of sale, showing when you purchased this car? A. I didn't look for the bill of sale because I didn't know that I had it, but as I had just finished papering our house I was putting some wall paper away in the garret and I ran onto a box that had some old wall paper and some letters in it, and amongst the junk was this bill of sale.

The paper referred to by witness "this bill of sale" is marked for identification Gulick Exhibit No. 23.

RQ. 312. Will you refer to Exhibit 23 and state just what it is and what it covers? A. It was a bill of sale given to me by the Amplex Manufacturing [94] Company, signed by Mr. Randall, and covered the Amplex car which I purchased from the company at that date, July 16, 1914, and is the same car in which the split aluminum pistons were installed. This car was driven for several hundred miles prior to my purchasing it and the new pistons were in the car when I took it over on this date.

RQ 313. Is there anything about the bill of sale which refreshes your recollection as to whether or not the pistons were in the car when you bought it? A. There is. They not being standard, I requested Mr. Randall to exhibit the mileage of the car and also the fact that there were other pistons in it; which he did.

RQ. 314. And what were those other pistons? A.

They were split pistons, aluminum pistons.

RQ. 315. Like Exhibit 11? A. Like Exhibit 11,

yes.

RQ. 316. Who made the red ink notations on this bill of sale, if you know? A. I don't know; either Mr.

Randall or his assistant, I presume.

RQ. 317. This notation reads, "Miles speedometer 816; new type pistons in moto"," and on the back I find the following notation, "R. Jernegan. This mileage, 61,12, when car was left in garage and was not driven but little after until Cook received it. E. J. Gulick." Who made the notation on the back of the bill of sale, Exhibit 23? A. I did.

RQ. 318. Do those notations refresh your recollection as to how far this car was driven with the pistons

like Exhibit 11 in them? A. They do...

RQ. 319. Can you state nearer than you did before what was that mileage? A. The split pistons were taken out prior to the receivership sale in November, 1914, and the standard type Buda pistons inserted. I can not tell just how many miles it was driven after that before it was sold to Cook, but it was driven very little. So the mileage in which the split pistons were used would be the difference between the 816 indicated on the bill of sale and the time which they were removed. As the car was laid up nearly all winter I doubt if it was driven more than two or three hundred miles before the sale, and this would leave apparently around forty-five hundred miles or in that neighborhood of actual operation for the split pistons. [95]

By Mr. Richey: The motorcycle piston marked by identification Gulick Exhibit 17 is offered in evidence as Gulick's Exhibit 17.

The blue print of the same marked for identification Gulick Exhibit 18 is offered in evidence as Gulick Exhibit 18. The piston marked for identification Gulick Exhibit 19 is offered in evidence as Gulick Exhibit 19.

The photograph marked for identification Exhibit 20 is offered in evidence as Exhibit 20. The bill of sale produced by the witness and marked for identification Gulick Exhibit 23 is offered in evidence as Gulick Exhibit 23.

By Mr. Kingsland: The offer in evidence of Exhibit No. 19 is objected to on the ground that it is incompetent, the date of its structure not having been established and not having been connected in any wise with the subject matter involved.

By Mr. Fletcher: The offer in evidence of Gulick Exhibit No. 17 is objected to on the ground that it has not been identified for the reason that the witness said that he had never seen it before.

The offer in evidence of Exhibits 18, 19, 20 and 23 are objected to on the ground of being improper redirect examination.

RQ. 320. When did you make the notation on the back of the bill of sale, Exhibit 23? A. My recollection is this was made in the sarly part of 1915; at any rate, it was after Cook had purchased the car. That date I am not absolutely clear upon.

By Mr. Richey: Redirect examination closed.

RE-CROSS EXAMINATION by Mr. Kingsland.

RX. 321. This Exhibit No. 11, in your opinion, does it embody the subject matter of the counts of these interferences?

By Mr. Richey: I object as incompetent. That

is the function of the patent office.

By Mr. Kingsland: Counsel has interrogated this witness on the construction of the counts and has requested his opinion as to whether he is the [96] inventor thereof and has asked him to apply structure to the counts.

By Mr. Richey: The witness was cross examined as to certain matters, as a result of questions by which counsel made the witness his own, but he

was not asked to interpret the counts.

By Mr. Kingaland: It is impossible to see how this witness could construe the counts and state that he was the inventor of the subject matter without involving a construction of the counts. The witness has not been made a witness for Hartog, but has been questioned on cross examination entirely within the scope of the direct examination.

By Mr. Richey: That part of the cross examination which asked for an interpretation of the counts and explanations of the terms of the counts and words in the counts had no bearing whatsoever on the direct examination, which related entirely to the facts, and counsel made the witness his own and now seeks to escape the responsibility of doing so.

A. It does to the extent of the functioning of the split skirt. However, in the structure it doesn't show or have the ribs of the same construction as shown in Exhibit 1.

RX. 322. Was there ever made a structure as shown in your application drawing that embodied the entire structure of the ribs supporting the bosses and the split skirt? A. There was

skirt? A. There was. RX. 323. When was that made? The castings were

made in the fall of 1914.

RX. 324. Were they ever tried out? A. They were

never machined up and tried out.

RX. 325. Did you ever make any measurements to determine whether or not the rib structure was flexible? A. I never did.

RX. 326. The opinions that you have expressed are

absolutely theoretical? A. They are not.

RX. 327. What actual facts have you upon which you base the opinions that you have expressed? A. From an engineer's viewpoint, any structure, it would be only reasonable to believe that such would be the case; further, the fact that the split skirt as tried out in [97] Exhibit 8 and later as constructed in 1914 and like Exhibit 11 confirmed our beliefs.

RX. 328. Exhibit 8 relies upon flexibility of the skirt wall entirely to perform its function, does it not?

A. It does.

RX. 329. Can a piston of Exhibit 8 in your opinion be fitted as closely as a piston as shown in your application drawing? A. As I have never tried out a structure as shown in Exhibit 1, I could not say. However, from the experience of Exhibit 8 in the Excelsior motor, the same as Exhibit 11 in the Buda motor, I would say it would be very close.

RX. 330. In other words, you would get the full result or approximately the full result from the use of the piston shown in Exhibit 8 as you would in a piston shown in Exhibit 1, is that correct? A. You would get a good

result, but not as perfect a result.

RX. 331. Where would the result differ? A. There would be a more uniform expansion of the skirt as designed in Exhibit 1 than as experimented with in Exhibit 8.

RX. 332. You are expressing that opinion from an engineering and theoretical standpoint, and not from anything that you know from actual tests of the fact, is that correct? A. From actual tests of Exhibit 8 and Exhibit 9 and Exhibit 11, not having finished up one like Exhibit 19; but from the performance of these other latter two, I would say the construction as of 19 would be superior in its functions to 8 and 11 and that it would

work perfectly.

RX. 333. Do you know of a piston of the construction of Exhibit 19 ever he ring been puttin actual use? A.

I do not

RX. 334. Exhibit 10 has the ribe running parallel to each other and in a straight line, has it not?

By Mr. Richey: I object. The piston is in evidence and is the best evidence of how the ribs run. The patent office can see this from the exhibit.

A. They have.

RX. 335. The pistons that you say were made and not completed following the general structure of [98] Exhibit 19, did they have the ribs curved or straight? A.

They were straight.

RX. 336. With a structure such as 19 is the circumferential expansion and contraction of the skirt uniform throughout the length of the circumference? A. I would not say that it is absolutely uniform, as it would be almost impossible or practically impossible to unite any form of rib and tie to the piston pin bosses and have a perfect cylindrical contraction or expansion.

RX. 337. Where would the greatest point of wear occur or points of wear? A. The greatest points of wear on a piston occur on the thrust sides which are at

right angles with the pins.

RX. 338. Isn't it also true that they would occur on a line in the plane of the ribs? A. That would be at right angles with the pin on the thrust side, which is the natural point of wear; and the object of the rib is to carry the load and transmit it to the skirt in that position.

RX. 339. Considering the thrust side, would there be any difference in the lines of wear in the arc represented by the thrust side in piston 19! A. The thrust side always carries the most wear owing to the excessive load over the free running or compression side.

RX. 340. I think that you probably misunderstood the last question. Will you consider the question again

and make an effort to answer it?

The notary reads RX. 339.

A. I can only state that there would be very little wear on the sides in a plane with the pin; there would naturally be more wear on the thrust side, which would be at right angles with the pin, and which would be the pressure position of the skirt in relation to the ribs. As far as there being any distinguishing lines after the structure had seated itself to the cylinder walls, there

would be practically no difference.

RX. 341. How close was the piston of Exhibit 8 construction fitted in the cylinder of the engine? A. They were fitted just as close as they could be machined and made to slide through freely dry. This does not include the head portion carrying the rings, as ample [99] clear ance was given to the head portion, as in all cases of all pistons, to prevent any chance of seizing where there is no means for expansion.

RX. 342. The supplemental oath that was inquired about on cross examination and re-direct was executed

at Cleveland, was it? A. It was.

RX. 343. What were the circumstances under which it was executed, if you now recall? A. I don't recall just what the circumstances were. I was in Cleveland and I was at the offices of—I don't know whether it was Gehr or who it was, but I was up to somebody's office up there anyway, and we were simply talking over the situation, or talking over this piston structure, and the amendment papers were given to me and read over, and I read them over and signed them. I had no recollection of it; I had forgotten all about it.

RX. 344. Was the supplemental oath prepared by Mr. Tibbetts or by someone else? A. I can't say who it

was prepared by.

RX. 345. By whom was it submitted to you? A. I don't know who gave it to me and handed it to me.

RX. 346. In whose office was it submitted to you?

A. Well, that I can not say because, to the best of my recollection, the name of the institution was—well, there was a Watts connected with it; I guess that is about all I remember, somebody and Watts, as I recall it. I don't know what the name of the business was, whose the attorney's office was, but Watts, I guess, and Mr. Slough. RX. 347. Were these gentlemen partners of Mr.

RX. 347. Were these gentlemen partners of Mr. Richey who is representing your application here! A.

I can't say that; I don't know.

RX. 348. What building was it in, do you know? A.

No, I do not.

RX. 349. At whose request did you go to Cleveland?

A. That I don't know.

RX. 350. Was the Pomeroy Hartog interference mentioned to you?

By Mr. Richey: Objected to as immaterial and counsel makes the witness his own.

A. Pomeroy Hartog? It was not. [100]
RX. 351. Are you positive of that? A. I am. I
don't know that I ever heard the name before until I
heard it today, heard it in this case if I heard it at all.

RX. 352. Did you know at that time any interest in the invention had been assigned to other parties than

the Packard Company? A. I did not.

RX. 353. Did you learn later that it had been? A. I learned that some sort of a deal hadeheen made by the Packard Company, but didn't know what it was; don't know today who owns it.

RX. 354. Did the parties at whose request you executed the supplemental oath purport to represent the Packard Company at that time? A. Well, I can't say as to that either.

RX. 355. Did you have anything to do with the mak-

ing of Exhibit No. 191 A. I did not.

Mr. Kingsland: That is all.

RE-CROSS EXAMINATION by Mr. Fletcher.

RX. 356. Am I to understand that the red lines which you have sketched on Exhibit No. 17 with respect to the slotting of the piston is identical with the slots or slotting of Exhibit 87 A. The same general character.

RX. 357. Then from what you say, the type or kind of slotting made in Exhibit 17 as indicated by the red lines was the first slotting made by you on pistons, is

that correct? A. That is correct.

RX. 358. What position did Mr. Randall hold with the Amplex Motor Company! A. Well, he was sort of a-he was manager for the receiver, and when he went with us he was a director and stockholder and served as factory manager.

RX. 359. Was he director and stockholder of the company at the time he receipted the bill of sale marked

Exhibit 23! A. He was.

RX. 360. Where is Mr. Randall now? A. I don't

know, but believe he is in Toledo.

RX. 361. At the time you signed the supplemental oath referred to in the cross examination of Mr. Kingsland were you advised by anyone of a certain [101] patent having issued before November, 1922, as relating to slotted piston? A. I was not.

Mr. Fletcher: That is all.

RE-DIRECT EXAMINATION by Mr. Richey.

RQ. 362. When, with respect to the sale of the car covered by the bill of sale of July the 16th, 1914, Exhibit 23, were the split pistons put in the car? A. Right immediately after the car was purchased.

RQ. 363. They were not in the car at the time you

purchased it, were they? A. No, they were not.

RQ. 364. The split skirt pistons that were put in the car were yours before they were put in the car, weren't they? A. They were my personal property; I paid for them, as I had made no assignments of any patents or designs or appliances to the Amplex Manufacturing Company, or at any time up to the receivership in 1914.

RQ. 365. That is, you mean you paid for the castings? A. I paid for the castings; and also I paid for the castings through the Amplex Company.

Mr. Richey: That is all.

RE-CROSS EXAMINATION by Mr. Kingsland.

RX. 366. At the time you got the bill of sale, Exhibit No. 23, was the pistons of Exhibit No. 11 installed in the car? A. They were installed in the car the day it was sold to me.

RX. 367. Well, when was the payment for the car made in relation to the date that you got it? A. Payment for the car was made, the money was turned over to the company some, oh, I should say a week or ten days prior to the bill of sale, as I had advanced the company some money and this was a consideration for the money that I had advanced to the company.

RX. 368. In other words, you had a credit with the

company! A. Yes.

RX. 369. And the credit was absorbed by taking

over the car? A. That was it.

RX. 370. Did you make any separate payment for the pistons that were installed in the car, or was it [102] all covered by one purchase price! Ar No, it was not covered by one purchase price. I purchased the car as it was at that time with the Buda pistons in it and the pistons as were put in it, the split pistons as were put in it like 11, were my personal property, and, as I recollect, they were billed to the Amplex Manufacturing Company and I paid for them; but they had nothing to do with the sale of the car.

RX. 371. Did you pay a separate consideration for the pistons to the Amplex Company! A. I did. I paid for the material and paid for the work that was done

on them.

RX. 372. Have you any paper showing the transaction of the purchase of the pistons as a separate item?

A. I have not.

RX. 373. But you are sure that there was a separate memorandum of purchase for the pistons, is that correct? A. Positively sure.

Deposition Closed.

EDWARD J. GULICK. [103]

PLAINTIFFS' EXHIBIT NO. 66. Patent Office List of Applications of Long. (Filed January 27, 1934.)

(Attorney's Room, Jun 29 1925 U. S. Patent Office.)
(Docket Division Jul 2 1925 U. S. Patent Office)
To the Hon. Commissioner of Patents:

Please permit the H. H. Franklin Manufacturing Company of Syracuse, New York, or its authorized agent or attorney to inspect the files and make copies of the papers therein of each of my pending applications as follows:

Serial Number .	Title	Filed
231,786	Case "A"	May, 1919
281,175	Case "D"	March, 1919
304,283	Case "E"	June 14, 1919
317,273	Case "F"	August 13, 1919
339,892	Case "G"	November 22, 1919
375,673	Case "H"	April 22, 1920
437,690	Case "I"	January 17, 1921
432,719	Case "J"	December 23, 1920
522,974	Case "L"	December 17, 1921
602,660	Case "M"	November 22, 1922
624,463	Case "N"	March 12, 1923
		Charles Charles

Signed at Detroit, State of Michigan, this 13th day of April, 1925.

(Seal)

Long Piston Corporation Elmer C. Long President

Elmer C. Long

WITNESS:

Fred G. White

PLAINTIFFS' EXHIBIT NO. 67-B.

Opinion of Examiner in Interference No. 49,569.

(Filed January 27, 1934.)

Final Hearing March 23, 1928.

In the United States Patent Office.

Patent Interference No. 49569.

Hartog v. Long v. Gulick.

Pistons.

Application of Stephen D. Hartog filed February 16, 1920, No. 359,137.

Applications of Elmer C. Long filed August 13, 1919, No. 317,273; filed March 7, 1919, No. 281,175.

Application of Edward J. Gulick filed November 30, 1917, No. 204,661.

Messrs. Rippey & Kingsland for Hartog. Messrs. Swan, Frye & Murray for Long. Mr. Ray S. Gehr for Gulick.

The interference includes two counts, count 2 having originally constituted the sole count of Interference No. 49,572, consolidated herewith October 8, 1925. The two counts read as follows:

Count 1: A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls in-tegrally uniting said bosses, the guide portion and the head portion.

Count 2: A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

The inventions defined by these counts constitute two of the numerous efforts to construct pistons for internal combustion engines of aluminum or aluminum alloys. Because this material has a large coefficient of expansion it was found that a plain piston, would be either too small when cold or too large when hot. Special structures have been designed to counteract the tendency of the pistons to expand and these two counts define two of such structures.

Hartog does not dispute priority with Guliek but contends that Gulick did not disclose the invention of these counts in his application as filed. With respect to count 1 it was ruled by the law examiner on April 4, 1924, that the Gulick application disclosed the invention. With respect to count 2 the law examiner made a similar ruling on the same date, his opinion on this count being Paper No. 40 in Interference File 49,572. There is no evidence which was not before the law examiner from which it could be inferred that Gulick has no right to make the counts. The matter, therefore, is not open for reinvestigation by the examiner of interferences (Rule 130). This question has been discussed somewhat more fully in an opinion of even date herewith made in Interference No. 49,570. That discussion is relevant particularly to count 2 of the present interference.

Long bases his case for priority over the November 30, 1917, filing date of Gulick on what he designates as his type "F" piston for count 1, and his type "D" pis-

ton for count 2.

Concerning the type "F" piston it is stated in brief for Long on page 18 that he testifies to conception in March or April, 1917, and explanation to others about the same time, that he personally made up several of the pistons in his shop in Hannibal, Missouri and installed a set of the pistons early in 1917 in the car of one Sprick and in Franklin motors. Long's testimony is found in his record (pp. 211 to 224) and it does not include a particle of contemporary evidence supporting the 1917 date.

It is entirely clear that an inventor like Long working all the while on such pistons from 1913 until he testified in 1926 would not have any reliable, independent recollection that he made a particular piston in 1917 when there were no definite associations by which to fix this year. Entirely aside from the rule in interferences that there must be corroborated proof for conception and reduction to practice, it would have to be held that Long has failed to give any satisfactory testimony from which it can be concluded that he conceived fount 1 prior to Gulick's filing date.

With respect to corroboration as to Long's conception of count 1 prior to November, 1917, it may be said that there is substantially nothing. The Long brief relies upon the testimony of the witnesses Cotter, Royalty,

and Marks.

Royalty's testimony relates to the year 1918 and Marks's to the last part of 1917 or the forepart of 1918. This leaves for consideration the testimony of Cotter only.

Cotter testifies (Record, p. 94) that about 1917 Long had a piston similar to Exhibit 1 as nearly as he could remember but that Long mad, several changes and Cotter could not explain all of these changes. Cotter then attempts to describe the piston to the best of his recollection. In answer to Question 44 Cotter says that Long made so many different changes that he does not know that he could describe any more of the pistons that Long made.

It is entirely clear that Cotter, testifying about nine years after the event, was entirely truthful in admitting that he did not recall a definite piston. That Long had pistons during this interval is unquestionably true. But he has failed to prove that he had, at this early date, a piston satisfying count 1 of the interference.

piston satisfying count 1 of the interference.

With respect to count 2, which Long bases on his so-called "D" type, Long claims conception in 1916 and he identifies the piston, Exhibit 1, as having been made by him in that year. His answer to Question 53, (p. 22)

is as follows:

That particular piston I would say was made in the forepart of 1916, I made in the early part of 1916 several sets of this type.

Here, again, as in connection with count 1, Long is testifying as a matter of sheer memory and the unaided memory of a witness testifying ten years after the event as to one of a large number of similar pistons is not sufficiently reliable. Long's answer already quoted, as well as his answer to Question 49 that "I would say" this piston was made sometime in 1916, indicates that Long is not deliberately falsifying but simply giving his vague impression as to what he had done ten years earlier.

There is no satisfactory corroboration of Long's

There is no satisfactory corroboration of Long's claim for conception prior to Gulick's filing date. The witness Cotter when shown Exhibit 1 stated that it looked like a Long piston and that he made either it or one like it about 1916 (Q's. 42, 50, 51, Record, pp. 73-74). On cross-examination Cotter declines to swear that he personally made Exhibit 1 and that the date 1916 was

given from unaided memory.

The witness Sanders had been a Chicago dealer in Franklin automobiles and he testifies that he met Long in the year 1914 at a time when Long had a machine shop in Quincy (Record, pp. 106-107). As it appears from Long's own testimony (pp. 40-41) that he had no interest in Quincy until 1917 it is manifest that the witness Sanders is mistaken in his date to the extent of three years. This illustrates very well the unreliability of memory for such long periods. The effort of Sanders to describe the piston that he saw was also partially un-

successful (pp. 112-113). The witness Stellman had been engineer for the H. H. Franklin Mfg. Co. and he testifies that a piston of similar design to Exhibit 1 was shown to him by Long in March, 1916 (Record, pp. 125-129). He also states in answer to Question 55 that Long brought or sent pistons to the Franklin Company from then on in varying quantities for test. The records of the Franklin Company, however, do not show any test prior to October, 1918. (See Gulick's Record, pp. 176-178, and Long Record, pp. 300-312.) The witness Stellman testifies that he first saw the Long piston at the Chicago automobile show in 1916, but Stellman attended shows in other years (Record, p. 137) and he has no satisfactory way of fixing the 1916 show as the one at which he saw Long piston. On cross examination in answer to XQ. 114 he stated that the piston which he saw in 1916 was not iden-

tical in construction with Exhibit 1.

The witness Royalty is an automobile mechanic who saw pistons in Long's place of business in 1916 and states that Exhibit 1 is like the sample which he saw at this time. (Q's. 40, 52, and 53, Record, pp. 144-148.) On cross examination he is somewhat more definite in stat-

ing in answer to XQ. 152 that the construction of Exhibit 1 is the same that he had seen in Long's place in Hannibal, Missouri, but that he would not say that he ever saw Exhibit 1 itself. As he stated in answer to Q. 39 (p. 176), it is pretty hard for anyone to remember exact details of construction, after several years. This testimony fails sufficiently to fix any specific year when he saw the piston like Exhibit 1.

The only other witness relied upon by Long as corroborating his prior conception of count 2 is the witness. Wood and his testimony is much more indefinite than that

of the other witnesses already discussed.

Long's entire case for priority of conception is in substance based upon the unaided memory of several witnesses speaking about ten years after the event and speaking then with the degree of uncertainty that is inevitable under such circumstances. Long had fifteen to twenty applications for split-skirt pistons on file at the time he was testifying, and had built a great many different forms for which no application was made. (Record, p. 42.) It was thought that no one after a period of many years would be able to recall the particular year when he saw a specific structure of any particular kind of piston from a large number of similar pistons unless there was some special facts that had impressed upon the mind of the witness this particular year and structure. The Long case for priority is fatally defective as to date and identity of the invention of count 2.

There are no facts upon which the examiner of interferences would rule that the Gulick application fails to disclose the inventions defined by the two counts. There is no adequate proof that Long had conceived the invention of either of these counts prior to Gulick's filing date. It is, therefore, held that Gulick is the first in-

ventor of the subject matter of both counts.

Priority of invention of the subject matter in issue is hereby awarded to Edward J. Gelick, the senior party.

Limit of appeal: August 2, 1928.

H. I. Houston,

Examiner of Interferences.

July 2, 1928.

'PLAINTIFFS' EXHIBIT NO. 67-C. Opinion of Board in Interference No. 49,569, (Filed January 27, 1934.)

Appeal Nos. 252-253. Hearing: May 3, 1929

REH

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS

HARTOG V. LONG V. GULIER

Patent Interference No. 49,569 between the application of Stephen D. Hartog, filed Feb. 16, 1920, Serial No. 359,137; and applications of Elmer C. Long, filed Aug. 13, 1919, Serial No. 317,273; and Edward J. Gulick, filed Nov. 30, 1917, Serial No. 204,661. Pistons.

Messrs. Rippey & Kingsland for Hartog. Messrs. Swan, Frye & Murray for Long. Messrs. Evans & McCoy for Gulick.

This is an appeal from the decision of the Examiner of Interferences by the party Hartog and the party Long on the award of priority to the party Gulick.

The invention involved is defined by two counts as follows:

1. A piston for internal combustion engines comprising in combination a head portion having an end wall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split lengitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

2. A piston having a head with top and side walls in combination with a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts formed with air spaces between their upper edges and the bottom edge of the side wall of the head, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.

The invention relates to a piston of the split skirt type in which there is yielding means between the head and sections of skirt of the piston and piston pin sup-

ports are carried by the yielding means.

filing date.

The filing date of the party Gulick is November 30, 1917, and the party Hartog does not urge priority over this date but the party Long offers testimony which he urges proves conception prior to Gulick's filing date. Long submits no additional brief analyzing the decision of the Examiner of Interferences, and, while Long's counsel was present at the hearing, no specific oral argument was presented along this line. We have carefully considered the decision of the Examiner of Interferences on this point and concur in his decision in holding that the evidence offered did not show conclusively that Long had established a date of conception prior to Gulick's

It is urged by both Long and Hartog that Gulick is not entitled to make the count. It is contended that there was nothing in the original disclosure of the Gulick application which in any way referred to the means for supporting the skirt of the piston as being resilient. careful discussion of Gulick's structure in relation to the application as originally filed has been made in our decision in interference No. 49,570 in which the same parties are involved and in which a decision is being rendered as of even date herewith. In that decision we reach the conclusion that although there is nothing in Gulick's application as originally filed that refers to resiliency, we consider that this feature is necessarily inherent in the structure as the support for the split skirt must be resilient in order to allow the piston to expand without expanding the skirt. We therefore concur in the decision of the law examiner referred to in the decision of the Examiner of Interferences that Gulick can make count

2. We also concur in the decision of the law examiner, as set forth in paper No. 39 of April 4, 1924, referred to in the decision of the Examiner of Interferences, that

Gulick is entitled to make count 1.

We are urged to take note of certain patents which, it is contended, constitute anticipation but this matter is not before us for consideration and we do not deem it advisable to take it up of our over initiative, especially as these patents have been referred to in the records of these interferences for several years.

The decision of the Examiner of Interferences awarding priority of the subject-matter of the two counts

to Edward J. Gulick is affirmed.

M. J. Moore, Sassistant Commissioner,

G. R. IDE, Examiner-in-Chief,

W. L. THURBER, Examiner-in-Chief.

June 3, 1929.

BOARD OF APPRALE

PLAINTIFFS' EXHIBIT NO. 68-A.

Opinion of Examiner in Interference No. 49,575. (Filed January 27, 1934.)

Hearing: Mar. 4, 1924.

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IN THE UNITED STATES PATENT OFFICE.

DAY VS. TAYLOR VS. LONG VS. MAYNARD VS. GULICK.

PATENT INTERFEBENCE No. 49,575.

MOTION TO DISSOLVE.

PISTONS.

Application of Ray E. Day filed Jan. 10, 1923, Ser. No. 611,698.

Application of George A. Taylor filed June 17, 1922, Ser. No. 569,104.

Application of Elmer C. Long filed Dec. 17, 1921, Ser. No. 522,974.

Application of Howard E. Maynard filed Jan. 5, 1921, Ser. No. 434,467.

'Application of Edward J. Gulick filed Nov. 30, 1917, Ser. No. 204,661.

'Mr. Clarence E. Mehlhope for Day.

Messrs. Macleod, Calver, Copeland & Dike for Taylor.

Mr. Herbert G. Fletcher for Long.

Mr. J. King Harness for Maynard.

Mr. Ray S. Gehr for Gulick.

The party Long moves to dissolve on the ground that the party Gulick is not entitled to make the count which is as follows:

A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the herd portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

It is practically conceded by the motion that Gulick can make all of the count upon his disclosure except the last clause, "said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion." It will not be necessary therefore to point out how the count reads upon Gulick's drawings in other respects. The skirt 11 has a split 21, clearly shown in Fig. 2, extending from top to bottom of the skirt on one side only of the pin bosses in Figs. 3 and 4. If the split permits free expansion and contraction of the skirt portion there is no need for argument to support Gulick's right to make the count.

Long argues that Gulick's piston is of rigid construction and Long's piston has a flexible structure. The Gulick specification describes a piston adapted to expand but not expand against the cylinder wall to such an extent as to stick, and it is split longitudinally so that it will not expand in circumference with a force great enough to cause the piston to stick. An expansion and contraction of the skirt portion is therefore permitted by the longitudinal slit. The rigidity of the webs 17, 18 with relation to the piston head is effected by the transverse stiffening ribs above the bosses 16 which may be seen in Figs. 1, 2, and 3 but on the side of the bosses 16 and below them there are no stiffening ribs. This is clear from Fig. 4.

The expansion and contraction mentioned in the count are due to thermal action, the head of the piston when in operation being highly heated. The effect of mechanical stresses is not taken into account. If the skirt 11 expands circumferentially when heated, as the specification states, the flanges or ribs 17 and 18 must allow such expansion and it is not material for the present purpose whether they move about one end or are slightly flexed laterally. The stated purpose of the lengitudinal split being to prevent too great circumferential expansion, obviously some circumferential expansion takes place. Free expansion can not imply the absence of ribs connected to the skirt since Long has such ribs. If there is any difference of structure by reason of which Long's ribs 12, 13 permit expansion of the skirt and Gulick's ribs 17, 18 do not permit expansion of the skirt, the difference is not recited in the count.

Gulick discloses all the structural elements set forth in the count, and refers to the circumferential expansion of the skirt, the split 21 preventing too great an expansion. This seems to be all that is necessary, and it is not important how Gulick may have described his device if as a matter of fact it has the requisite structure and function.

The motion is denied.

I. P. DIBNEY, Law Examiner.

Apr 4 1924.

PLAINTIFFS' EXHIBIT NO. 68-B. Opinion of Board in Interference No. 49,575. (Filed January 27, 1934.)

NLH

Hearing: June 20, 1924

Appeal No. 10,422. U. S. Patent Office. August 7, 1924. Before the Examiners-in-Chief, on Appeal.

In the matter of the interference between the application of Elmer C. Long, filed December 17, 1921, Serial No. 522,974 and the application of Edward J. Gulick, filed November 30, 1917, Serial No. 204,661. Interference No. 49,575.

Pistons.

Mr. Herbert G. Fletcher for Long. Mr. Ray S. Gehr for Gulick.

This is an appeal by Long from the decision of the examiner of interferences awarding priority of invention to the serior party Edward J. Gulick upon the record.

The issue is as follows:

A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

The party Long moved to dissolve the interference on the ground that the party Gulick is not entitled to make the claim in issue. This motion having been denied by the law examiner the question of the right of Gulick to make the claim is now raised as the sole ground of this appeal, under the provisions of Rule 130.

It is admitted that the drawings of Gulick disclose all the structure specified in the count, the only contention being that his structure is such that it will not "permit free expansion and contraction of the skirt portion." The skirt is split at 21 and the specification states, page 3, line 21: "In order that the skirt may not expand an undue amount when the piston is heated, as under operating conditions, it is split longundinally as at 21."

The object of the split is to permit this expansion, the increased circumference being allowed for by the slot, instead of forcing the wall out radially against the cylinder as would be the case if the slot were absent. If the webs 17, 18 were so rigid that they would not yield laterally, the slot would have no function. Under the action of the heat, the circumferential expansion of the skirt would necessarily flex the webs 17 and 18 sufficiently to permit the expansion without substantial increase of the diameter of the skirt.

We have no doubt that Gulick can make the claim of the issue and the decision of the examiner of interferences is affirmed, priority of invention being awarded to Edward J. Gulick, the senior party.

> Frank C. Skinner, E. S. Henry, Sidney F. Smith,

Examiners-in-Chief.

Limit of Appeal: August 27, 1924.

PLAINTIFFS' EXHIBIT NO. 68-C.

Opinion of Court of Appeals of District of Columbia in Interference No. 49,575.

(Filed January 27, 1934.)

IN THE COURT OF APPEALS
OF THE DISTRICT OF COLUMBIA.

ELMER C. LONG,

Appellant,

No. 1868.

V8.

EDWARD J. GULICK.

Before Martin, Chief Justice; Robb and Van Orsdel; Associate Justices.

VAN ORSDEL, Associate Justice. This appeal is from the decision of the Commissioner of Patents in an interference proceeding in which priority of invention was

awarded to the senior party Gulick.

The single count in issue reads as follows: "A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion."

The party I ong moved to dissolve the interference on the ground that Gulick is not entitled to make the claim. The motion was denied by the Law Examiner, and his ruling was sustained on appeal by the Board of Examiners in Chief and by the Commissioner of Patents.

No testimony was taken in the case, and Long being the junior party, the only question to be reviewed is Gu-

lick's right to make the claim.

The drawings of Gulick, we think, clearly disclose the structure of the count. It is contended, however, that his structure is not such as will "permit free expansion and contraction of the skirt portion." But the claim expressly covers this objection in the following language: "Said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion." We think it clear that the

object of the split is to permit of this expansion and, as held by the Board of Examiners, "under the action of the heat, the circumferential expansion of the skirt would necessarily flex the webs sufficiently to permit the expansion without substantial increase of the diameter of the skirt."

In this view of the case the right of Gulick to make the claim is beyond question. This point being settled, priority on the record goes to the party Gulick as a mat-

ter of course.

The decision of the Commissioner is affirmed.

JOSIAH A. VAN OBSDEL,

Associate Justice.

No. 1868 Patent Appeal. Elmer C. Long, Appellant, vs. Edward J. Gulick. Opinion of the Court per Mr. Justice Van Orsdel. Court of Appeals. District of Columbia. Filed February 7, 1927. Henry W. Hodges, Clerk.

A true Copy

Test: HENRY W. HODGES,

(Seal) Clerk of the Court of Appeals of the District of Columbia.

PLAINTIFFS' EXHIBIT NO. 69-A(1). Opinion of Law Examiner in Interference No. 49,570. (Filed January 27, 1934.)

Hearing: Mar. 3, 1924.

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IN THE UNITED STATES PATENT OFFICE.

DAY VS. TAYLOB VS. LONG VS. MAYNARD VS. JARDINE VS. HARTOG VS. GULICK.

PATENT INTERFERENCE No. 49,570.

MOTION TO DISSOLVE.

PISTONS.

Application of Ray E. Day filed Jan. 10, 1923, Ser. No. 611.698.

Application of George A. Taylor filed June 17, 1922, Ser. No. 569,104.

Application of Elmer C. Long filed Dec. 17, 1921, Ser. No. 522,974.

Application of Howard E. Maynard filed Jan. 3, 1921, Ser. No. 434.467.

Application of Frank Jardine filed March 9, 1921, Ser. No. 450,898, renewal of application filed March 11, 1920, Ser. No. 364,997.

Application of Stephen D. Hartog filed Feb. 16, 1920, Ser. No. 359,137.

Application of Edward J. Gulick filed Nov. 30, 1917, Ser. No. 204,661.

Mr. Clarence E. Mehlhope for Day. Messrs. Macleod, Calver, Copeland & Dike for Taylor.

Mr. Herbert G. Fletcher for Long.

Messrs. Whittemore, Hulbert & Whittemore and Mr. J. King Harness for Maynard.

Messrs. Richey, Slough & Watts for Jardine.

Messrs. Richey, Slough & Watts for Jardine. Messrs. Rippey & Kingsland for Hartog. Mr. Ray S. Gehr for Gulick.

The party Hartog moves to dissolve on the ground that the party Gulick has no right to make the claim because Gulick does not disclose the essential element

"internal yielding ribs supporting the head and body."
The count is as follows:

A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

At the hearing the party Gulick offered certain af-Mavits in support of Gulick's right to make the count and to traverse references cited in other motions in related interferences. The party Hartog objected to the affidavits on the ground that they were inadmissible because they were expert opinion affidavits and were not. filed at least five days prior to the hearing. The objection was sustained in view of the decision in Horton v. Leonard, C. D., 1910-81, without prejudice to the filing of proper affidavits in other related interferences restricted to consideration of the references. Since the interference is one of a series in which numerous motions are to be heard, involving the same references, the party Hartog will have ample time to consider the unobjectionable part of the affidavits before the termination of the discussion so that objection to the admissible part of the affidavits because of insufficient notice becomes technical.

The head of the Gulick piston is part 10, the body is skirt 11, the internal ribs supporting the head and body are ribs 17, 18 with extensions 20, and the means on the ribs adapted to form engaging connection with operable parts for said piston is the bosses 16 which receive the

wrist pins of the connecting rod. It will be apparent that the question for decision is whether or not the ribs 17, 18, 20 are yielding. The extent and character of the yielding, or any definite construction or configuration of the rib by which it is made to yield are not expressly stated in the count. There are several forces at work upon the ribs when the piston is in operation resulting from a thermal expansion due to heat transmitted from the intensely heated surface of the piston head, and mechanical stresses during compression or explosion of the gas. The material used in most cases is a light aluminum alloy having a much larger coefficient of expansion than cast iron and ordinarily requiring a greater initial clearance between piston and cylinder than cast iron. The head expands radially to a greater extent then the skirt, and the ribs would presumably expand more than the skirt because heat is transmitted

directly to the ribs and the skirt is separated from the head by the annular opening 12. If Gulick's ribs are yielding on account of thermal action thereon, it will be unnecessary to consider if they are yielding in response to mechanical stresses. The skirt 11 expands circumferentially under the influence of heat, and the slit 21 is provided to prevent too great expansion. The upper parts of the ribs are stiffened by transverse flanges between the piston head and the pin bosses but the lower parts are free from stiffening flanges and directly connect the pin bosses to the skirt by relatively narrow rib portions as shown in Fig. 1. If the skirt and the ribs expanded uniformly so that elongation of a rib would be accompanied by a corresponding circumferential elongation of the skirt, the rib and the skirt moving together to the same extent, there might not be any substantial lateral flexure or yielding of the rib but it is not seen how they can expand uniformly or how some lateral flexure or yielding of the rib 18 between the boss and the skirt can be avoided. The yielding need not be great or due to any special structure of the rib to support the count. Nor is it necessary that the entire rib should yield. If it yields at all for any purpose or for any reason, it would come within the scope of the count. It can not be conceded that the purpose of slot 21 in Gulick's skirt is defeated by alleged rigidity of the lower parts of the ribs, and Gulick is obviously not alone in stiffening the parts of the ribs above the pin bosses. Hartog's rib structure is no where mentioned in the count and can not be read into the count by any accepted rule of interpretation. Scott vs. Longtin, C.D., 1922-145. The intended scope of the count is obvious from the different specific disclosures in the respective applications of the several parties.

The motion is denied.

I. P. DISNEY,

Law Examiner.

Apr 4 1924

PLAINTIFFS' EXHIBIT NO. 69-A(2). Opinion of Examiner of Interferences in Interference No. 49,570.

(Filed January 27, 1934.)

Final Hearing: March 23, 1928.

ES/HMH

IN THE UNITED STATES PATENT OFFICE.

PATENT INTERFERENCE No. 49,570.

LONG V. HARTOG V. GULICK:

PISTONS.

Application of Elmer C. Long filed December 17, 1921, No. 522,974.

Application of Stephen D. Hartog filed February 16, 1920, No. 359,137.

Application of Edward J. Gulick filed November 30, 1917, No. 204,661.

Messrs. Swan, Frye & Murray for Long. Messrs. Rippey & Kingsland for Hartog. Mr. Ray S. Gehr for Gulick.

The invention involved is defined in a single count as follows:

1. A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

The party Hartog claims no date earlier than Gulick's filing date. As between Hartog and Gulick, the sole question is whether the Gulick application as filed disclosed the invention defined by the count. And with respect to the count, the controversy centers entirely around the word "yielding." Hartog's motion to dissolve was denied by the law examiner in an opinion of April 4, 1924. The law examiner ruled that the ribs 17, 18 and 20, shown in Hartog's application as filed, would at least be yieldable in response to thermal action and that this would satisfy the requirement of the count. He further ruled that when the skirt 11 expands uniformly

with the ribs there will be an elongation of the ribs corresponding to the circumferential elongation of the skirt. He therefore denied Hartog's motion to dissolve, and held that Gulick disclosed the invention in his application as filed.

It is recognized that Gulfek did not mention in his original application any yieldability of the ribs or in any way indicate recognition of this feature until years after the filing of his application. Hartog also urges that subsequent to the decision of the law examiner there was a ruling by the Examiners-in-Chief and by the Commissioner in another interference, Jardine v. Hartog, No. 49,578, that should control the interpretation of the count in the present interference. It is thought, however, that this ruling with respect to different disclosures, while significant and guiding, is not so clearly decisive as to justify the interference examiner in deciding that the ruling of the law examiner was erroneous (Rule 130).

Hartog has taken testimony directed to proving that his invention date is earlier than Long's, but he has not taken any to prove that the Gulick original disclosure did not include the invention of this count. On the other hand, Gulick has presented the testimony of the witnesses Gruenfeldt and Linney, directed to showing that a piston closely similar to the Gulick application disclosure is operative. From this operativeness Gulick argues that there must be a slight lateral flexing or yielding of the ribs. Whether this conclusion necessarily follows need not be decided. At least Hartog has presented no

testimeny on the subject.

It is noted also that the Court of Appeals of the District of Columbia has ruled in the case of Long v. Gulick, 360 O. G. 262; 1927 C. D. 134; 17 Fed. (2d) 686, that the webs of the Gulick application involved in the present interference are necessarily flexed under the action of heat.

Upon the whole case there does not appear to be any sufficient reason for the interference examiner to arrive at a conclusion contrary to the decision made by the law examiner with respect to Gulick's right to make the count.

There remains for consideration the question of priority as between Long and Gulick. Gulick's application was filed November 30, 1917, and Gulick presents testimony directed to showing that he made the invention earlier than this date. It is not found, however, that

Long has established that he had conceived the invention at any time prior to Gulick's filing date. The Long brief places reliance upon a piston which Long designates as the "G" type. This "G" type piston is illustrated by the Long Exhibit X-1 and Long testifies in answer to question 52, page 188, that this piston was made in the early part of 1917. He admits on cross-examination (XQs. 120-123; p. 198) that he gives this date of 1917 upon the basis of unaided memory. The testimony of a person speaking in 1926 as to what he had done in 1917 would be of little weight unless there was some way for establishing the time. This is particularly true in the present case because, as Long tells in answer to crossquestion 149, he was constantly experimenting on all types of pistons that he could think about, and under these circumstances it is not reasonable to believe that he could definitely determine that one particular piston was made in one particular year when he had nothing to aid him in fixing this year.

Even if Long's testimony itself were much stronger than it is, it would not be sufficient without corroboration, and Long has, no corroboration with respect to Exhibit X-1 for any date earlier than 1918. The witness Royalty thinks that he saw Exhibit X-1 at Quincy, Illinois, in 1918, but he is not positive (Qs. 53-58; pp. 177-178); the witness Wood testifies to a date in 1918 or 1919; he says that the piston he saw had some kind of a metal rod in it but he did not pay much attention to that (Q. 121; p. 245).

It is found that Long has not established that he had conceived the invention prior to Gulick's filing date and that the Gulick application as filed disclosed the invention in issue. Hartog claims no date earlier than Gulick's filing date.

Priority of invention of the subject matter in issue is awarded to Edward J. Gulick, the senior party.

Limit of appeal: August 2, 1928.

H. I. HOUSTON,

Examiner of Interferences.

July 2, 1928.

PLAINTIFFS' EXHIBIT NO. 69-B(1).

Petition for Rehearing in Interference No. 49,570.

(Filed January 27, 1934.)

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS.

ELMER C. LONG.

STEPHEN D. HARTOG.

INTERFERENCE No. 49,570.

EDWARD J. GULICK, @

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PETITION FOR REHEARING.

Comes now the party Hartog in the above entitled interference and moves for a rehearing of the decision of the Board of Appeals, dated June 3, 1929, and, for ground of the petition, shows to the Honorable Board the following:

1. That the Board misconstrued the disclosure of the Gulick application and, therefore, erred in its finding that—

"If the piston expands and the skirt does not we consider that the support for the skirt must necessarily be resilient and that this is an inherent quality of all pistons of this general nature."

- 2. That the Board erred, even on the assumption that the internal ribs of the Gulick structure were yielding, in permitting Gulick to predicate invention upon the characteristic of the ribs which the Board has found was not disclosed in the application as originally filed by Gulick.
- 3. That the Board has misconstrued the invention covered by the count of this interference, and has placed a construction on the count out of harmony with the Hartog application (in which the count originated) in which the ribs were shown of a structure (springlike in character) that was yielding, and were thus differentiated from the art.

4. That because of the construction given to the count this Board has held the count to be nothing more than was in the prior art and particularly in United States patent to Ebbs, No. 700,309, dated May 20, 1902, and United States patent to Van Bever, No. 1,031,212, dated July 2, 1912, in which the skirt was split and supported by an internal structure and in which, like the Gulick structure, the piston contracts by the flexibility of the skirt, and not by the inherent or actual resiliency or yieldability of the internal support.

WHEREFORE the party Hartog prays for a rehearing to the end that the errors in the decision of this Honorable Board may be corrected in order that justice may be done in the premises.

Respectfully submitted,

Attorneys for Hartog.

St. Louis, Missouri, June 13, 1929.

PLAINTIFFS' EXHIBIT NO. 69-B(2).

Opinion of the Board in Interference No. 49,570.

(Filed January 27, 1934.)

Appeal Nos. 254-255.

REH

• IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS

LONG V. HARTOG V. GULICK

Patent Interference No. 49,570 between the application of Elmer C. Long, filed Dec. 17, 1921, Serial No. 522,974, and applications of Stephen D. Hartog, filed Feb. 16, 1920, Serial No. 359,137, and Edward J. Gulick, filed Nov. 30, 1917, Serial No. 204,661. Pistons.

Messrs. Swan, Frye & Murray for Long. Messrs. Rippey & Kingsland for Hartog. Messrs. Evans & McCoy for Gulick.

PETITION FOR REHEARING.

The party Hartog has petitioned for rehearing from the decision of the Board of Appeals of June 3, 1929, affirming the decision of the Examiner of Interferences in awarding subject-matter of the count to the party Gulick.

Several allegations of error are set forth but they may be summed up by the statement that the party Hartog urges that we were in error in holding that the party Gulick had a right to make the count because the support for the piston skirt must necessarily be resilient. We have given careful consideration to the memorandum offered in support of the petition but it is unnecessary to discuss this in detail. All the matters referred to therein were before us at the time our decision was rendered and were carefully considered. The point upon which the reconsideration is asked is probably the most important one in the entire series of interferences in which the petitioner is involved. The point has been repeatedly considered in one form or another by tribunals of this office and also in one instance by the Court. We

reviewed the entire record and carefully considered the arguments presented. As a result of this investigation our judgment was deliberately made and we find no reasons presented in this petition which influence us to reach any other conclusion.

The petition for rehearing is therefore denied.

M. J. Moore,
Assistant Commissioner,
G. R. Ide,
Examiner-in-Chief,
W. L. Thubber,

Examiner-in-Chief,

BOARD OF APPEALS.

July 1, 1929.

REH

PLAINTIFFS' EXHIBIT NO. 69-B(3). Opinion of the Board of Appeals in Interference No. 49.570.

(Filed January 27, 1934.)

Appeal Nos. 254-255.

5.

Hearing: May 3, 1929

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS.

LONG V. HARTOG V. GULICK.

Patent Interference No. 49,570 between the application of Elmer C. Long, filed-Dec. 17, 1921, Serial No. 522, 974; and applications of Stephen D. Hartog, filed Feb. 16, 1920, Serial No. 359,137; and Edward J. Gulick, filed Nov. 30, 1917; Serial No. 204,661. Pistons.

Messrs. Swan, Frye & Murray for Long; Messrs. Rippey & Kingsland for Hartog; Messrs. Evans & McCoy for Gulick.

This is an appeal from the decision of the Examiner of Interferences by the party Long and the party Hartog on the award of priority to the party Gulick.

The invention involved is defined by a single count as follows:

1. A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston.

The invention relates to a piston of the split skirt type in which there is yielding means between the head and skirt of the piston and piston pin supports are carried by the yielding means.

The filing date of the party Gulick is November 30, 1917 and the party Hartog does not urge priority over this date, but the party Long offers testimony which he urges proves conception prior to Gulick's filing date. Long submits no additional brief analyzing the decision of the Examiner of Interferences, and, while Long's

counsel was present at the hearing, no specific oral argument was presented along this line. We have carefully considered the decision of the Examiner of Interferences on this point and concur in his decision in holding that the evidence offered did not show conclusively that Long had established a date of conception prior to Gulick's filing date.

It is urged by both Long and Hartog that Gulick is not entitled to make the count. It is contended that there was nothing in the original disclosure of the Gulick application which in any way referred to the means for supporting the skirt of the piston as being resilient. We have examined this application and we fail to find anything thereights originally filed that in any manner refers to the use of such a turn. In the brief of Hartog, (page 74), we find the following language:

"Under all of the testimony and under the findings of the Patent Office in Interference No. 49,578, Jardine v. Hartog, the ribs do not and cannot yield in the Long structure and they do not and cannot yield in the Gulick structure. This being true, Long as well as Gulick had no right to make count 2 of the present interference, and upon this ground, Hartog must be awarded priority of invention over both Long and Gulick.

This feature is the crux of the whole question where yieldability of the internal ribs is made a fea-

ture of the counts.

It is the most important point in the whole se-

ries of interferences.

Hartog is so firmly convinced that he is right on this proposition, that he urges and insists that this question must be examined and that this tribunal, bound as it is by the decisions of the Patent Office

We agree with Hartog that this feature is of greatest importance in the group of interferences that are before us, and in this connection we call attention to the fact that the interferences in which we are rendering decisions of even date herewith, and which were argued at the same time with the counsels for all the parties present are:

49,569, 49,570, 49,571, and 49,579.

We shall have occasion to refer to this decision in the other decisions, and the ruling which we make here in

regard to the question of resiliency of the supporting member for the piston skirt is intended to be applicable to all the cases, even including the pistons regarding which testimony has been offered for establishing early

conception.

In Gulick's brief (page 78), we find reference to the same question but in which a different set of decisions is relied upon and which terminate in the decision of the Court of Appeals of the District of Columbia. It is contended by the party Hartog that we should follow the decision in the Jardine v. Hartog interference, No. 49,578, which he holds is favorable to his case. Gulick urges that we should follow the decision in the interference No. 49,575 in which Long raised the same question against Gulick. Gulick contends that we must be bound by the decision of the Court.

We consider that neither party is right in taking his respective position. In interference No. 49,578 neither Long nor Gulick were parties. In interference No. 49,575 Hartog was not a party to the appeal. Of course careful consideration should be given to prior decisions of the same tribunal and great weight should be given to decisions of superior tribunals, but where the parties are different, it is the duty of those rendering a decision to

consider each particular case on its own merits.

As previously stated, we find nothing in Gulick's file in regard to the question of resiliency. It is perfectly clear, however, that when the piston skirt was split it was for the purpose of allowing it to yield when the heat caused the piston to expand. If the piston expands and the skirt does not we consider that the support for the skirt must necessarily be resilient and that this is an inherent quality of all pistons of this general nature. We therefore concur in the opinion of the law examiner as referred to in the opinion of the Examiner of Interferences that Gulick has a right to make the count.

Reference has also been made in the brief to the interference of Hartog v. Pomeroy, No. 45,351, but for reasons discussed in connection with the other interferences to which our attention has been called, we hold that the ruling in that interference is not binding upon us

in this appeal.

Hartog raises the question of estoppel and refers to prior interferences in which he contends the same parties in interest were involved. We fail to find any proof to

substantiate this contention.

June 3, 1929.

The decision of the Examiner of Interferences awarding priority of the subject-matter of the count to Edward J. Gulick is affirmed.

M. J. Moore,

Assistant Commissioner
G. R. Ide,

Examiner-in-Chief
W. L. Thurber

Examiner-in-Chief

BOARD OF APPEALS. PLAINTIFFS' EXHIBIT NO. 69-C.

Opinion of Court of Customs and Patent Appeals in Interference No. 49,570.

(Filed January 27, 1934.)

UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS.

STEPHEN D. HARTOG,
Appellant,

ELMER C. Long and EDWARD J. GULICK,

Appellees.

October term, 1930, Patent Appeal No. 2609, Patent Calendar No. 105, Interference No. 49,570.

BLAND, Judge.

And the second s

This appeal is from a decision of the Board of Appeals in the Patent Office awarding priority of invention in a single count to Edward J. Gulick in which the appellant and Elmer C. Long were parties. From the decision of the Board Hartog appealed here and Long did not.

The count in issue, which was taken from the Hartog application, is as follows:

1. A piston comprising a head and body, internal yielding ribs supporting the head and body, and means on said ribs adapted to form engaging connection with operable parts for said piston. [Italics appellant's]

The issue in this case involves the same invention and the same applications and substantially the same question as was involved in *Hartog v. Long and Gulick*, Patent Appeal No. 2608, Interference No. 49,569, decided concurrently herewith, and we follow the reasoning of that case in the decision of this one.

The invention relates to an automobile piston, the apron of which is made flexible or resilient in order that it may yield from the pressure occasioned by expansion due to heat. The details of the disclosures need not be repeated here.

This interference originally was between several different parties and progressed in the Patent Office concurrently with Hartog is. Long and Gulick, Interference No.

49,569, supra.

There are but two questions presented: First, had Gulick the right to make the count? Second, is Gulick estopped from making the count of this interference by reason of the decision in Hartog v. Pomeroy, Interference No. 45,351.

The first question is, as found by the board, "the most important point in the whole series of interferences." In determining whether Gulick had the right to make the count the crux of the whole question is the yieldable feature of the ribs of the two disclosures. In the instant case we think Gulick's disclosure meets the requirement of the claim in the phrase "internal yielding ribs supporting the head and body" for the same reasons that we concluded that his disclosure met the requirements of the phrase "being resiliently yieldable" in the count of the interference No. 49,569, supra. We approve the finding of the Board of Appeals which is expressed in the following language:

As previously stated, we find nothing in Gulick's file in regard to the question of resiliency. It is perfectly clear, however, that when the piston skirt was split it was for the purpose of allowing it to yield when the heat caused the piston to expand. If the piston expands and the skirt does not we consider that the support for the skirt must necessarily be resilient and that this is an inherent quality of all pistons of this general nature. We therefore concur in the opinion of the law examiner as referred to in the opinion of the Examiner of Interferences that Gulick has a right to make the count.

The case of Long v. Gulick, 17 F./(2d) 686, 57 Appls. D. C. 98, decided by the Court of Appeals of the District of Columbia and referred to by this court in Hartog v. Long & Gulick, Interference No. 49,569, supra, passed upon an issue almost identical with the issue presented here by the first question raised.

As to the second question presented we also agree with the finding of the board which is expressed in the following language:

Reference has also been made in the brief to the interference of Hartog v. Pomeroy, No. 45,351, but for reasons discussed in connection with the other

interferences to which our attention has been called, we hold that the ruling in that interference is not binding upon us in this appeal. Hartog raises the question of estoppel and refers to prior interferences in which he contends the same parties in interest were involved. We fail to find any proof to substantiate this contention.

Hartog suggests that Gulick cannot make the claim for the reason that he is barred from doing so by reason of the doctrine of equitable estoppel, arising from the fact that there was a community of interest or ownership of the subject matter of the interference in Hartog v. Pomeroy, supra, and the subject matter of the interference in the instant case. We find nothing in the record to justify the conclusion that such a community of interest exists as is suggested by appellant.

The Board of Appeals properly awarded priority of invention in the subject matter of the count involved in this interference to Gulick over Long and Hartog and affirmatively found that:

We have carefully considered the decision of the Examiner of Interferences on this point and concur in his decision in holding that the evidence offered did not show conclusively that Long had established a date of conception prior to Gulick's filing date.

The decision of the Board of Appeals, awarding priority of invention to Gulick, is affirmed.

APPIRMED.

PLAINTIFFS' EXHIBIT NO. 70-A.

Opinion of the Examiner in Interference No. 49,571.

(Filed January 27, 1934.)

Final Hearing: March 23, 1928.

ES/LAW

IN THE UNITED STATES PATENT OFFICE.

PATENT INTERFEBENCE No. 49571.

LONG V. GULICK.

PISTONS.

Patent granted Elmer-C. Long November 1, 1921, No. 1,395,441, on an application filed December 9, 1918, No. 265,947. Applications Nos. 317,273, filed August 13, 1919; 339,892, filed November 22, 1919.

Messrs. Swan, Frye & Murray for Long. Mr. Ray S. Gehr for Gulick.

The interference is defined in four counts as follows:

- 1. A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion and separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being cooperably connected at their opposite ends to said cylinder engaging portion.
- 2. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.
- 3. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from

the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

4. A one piece piston provided with a solid end portion and a skirt portion, said skirt portion having a longitudinally extending slot formed through the thickness of its wall, said slot extending from the rear edge of the skirt portion and forming adjacent disconnected portions in said skirt portion which are capable of being moved inwardly or outwardly without restraint.

The subject matter in controversy between Gulick and Long is a piston for combustion engines so constructed as to be suitable for material like aluminum having a high coefficient of expansion. This attribute of aluminum and its alloys causes pistons made therefrom to expand greatly when heated, so that an ordinary trunk piston is either too loose when cold or when hot it seizes the cylinder walls.

In support of his case for priority with respect to count 1, Long relies upon what he calls his "G" type piston. It is ruled in companion interference No. 49,570, decided simultaneously herewith, that Long has failed to establish conception of the "G" type piston prior Gulick's filing date. The Gulick application involved A the companion interference is likewise involved in the present interference. The testimony relied upon by Long in the present interference for the "G" type piston consists of the deposition of Long himself (pp. 65-92); that of Royalty (pp. 46-64); and that of Wood (pp. 145-169). The deposition of Long is printed in the record of the companion interference on pages 181-208; that of Royalty on pages 162-170; and that of Wood on pages 230-254. The testimony being the same, and the embodiment relied upon being the same, it is ruled, for the reasons set forth more fully in the decision rendered in companion interference 49,570, that Long has not proved conception of his Exhibit "G" piston prior to Gulick" filing date.

Long relies upon what he calls his Type "F" piston for priority as to counts 2 and 3. It is ruled in companion interference No. 49,569, decided simultaneously herewith, that Long has failed to establish conception of the "F" type piston prior to Gulick's filing date. The Gulick application involved in the companion interference is likewise involved in the present interference. The testimony relied upon by Long in the present interference for the "F" type piston consists of the deposition of Long himself (pp. 124-144); that of Cotter (pp. 13-32); that of Royalty (pp. 46-64); and that of Marks (pp. 213-220). The deposition of Long is the same as that in the said companion interference, there printed on pages 209-229. The Royalty deposition is printed in the other record at pages 162-170. The Marks deposition is printed in the other record at pages 300-307. The testimony being the same, and the embodiment relied upon being the same, it is ruled, for the reasons set forth more fully in the decision rendered in companion interference 49,569, that Long has not proved conception of . his Exhibit "F" piston prior to Gulick's filing date.

With respect to count 4, Long relies for priority upon what he calls his "B" type piston. As to this count Long is involved on his patent No. 1,395,441, the count being claim 10 thereof. This patent illustrates a piston having a "T" shaped slot in the skirt, best shown on Figure 2 of the patent drawing. The count, however, does not expressly require the horizontal element of the "T" shaped slot and it is assumed for the purpose of this decision that Long may establish priority by a piston having merely a longitudinally extending slot from the rear edge of the skirt portion, thus forming adjacent disconnected portions in the skirt capable of being moved inwardly and outwardly without restraint. There is testimony by Long himself that he made such pistons in the summer of 1913 and used them in the car on which he made a trip from Hannibal, Missouri, to St. Louis, Missouri and back (Record, pages 97-101). In answer to Q/8 Long asserts that he was in Hannibal from 1906 until 1913, but he remained there until 1917 (Q. 4; p. 65) His presence at Hannibal, therefore, does not fix the year 1913. The pistons operated satisfactorily on this trip to St. Louis, but the motor was torn down and abandoned, the pistons being sold as scrap.

Long was assisted in sawing the slots for these pistons by the witness Cotter and this witness corroborates Long as to the construction and installation of these pis-

tons (Record, pp. 23-27).

The weakness of the testimony by Long and Cotter is that neither of them has any way of establishing the year 1913. They testified in 1925, twelve years after the supposed test of these pistons. Long worked on a great many other pistons as appears from the record. His memory as to the particular year in which he tested a particular piston some twelve years prior to the time of testifying is not reliable, and the same must be said of the corroborating witness Cotter. There is no contemporary evidence of any character either physical or documentary.

Gulick testifies that pistons similar to his Exhibit 8 were successfully tried out in a Renault car in 1911. This Exhibit 8 piston includes both longitudinal and a horizontal slots. The motor was the property of the Excelsior Motor and Manufacturing Company, of Chicago, and according to Gulick's testimony he drove this Renault car to some road races at Elgin, Illinois, in August, 1911, and the pistons remained in the car until

October, 1911.

For Gulick's testimony there is the corroboration of the witness Williamson that he made this trip with Gulick, but Williamson did not see the pistons. The witness Engle describes, in answer to Q. 20, record page 167, his work in sawing the longitudinal slot in the pistons, and he recognizes Exhibit 8 as looking like those which he put into Gulick's motor. He accompanied Gulick on the trip to the Elgin road races and the pistons operated satisfactorily, but some months later the top broke from one of the pistons. The witness Engle is somewhat have in fixing the date of these events, but the fact that he left the employment of the Excelsior company near the end of the year 1911 helps him to fix the date.

Gulick's case for the 1911 date, like Long's case for the 1913 date, is defective for lack of contemporaneous evidence, but it is superior to the Long case in that there is a somewhat better fixing of the time. The fact that both parties failed to push their inventions to commercial use or patent application casts doubt upon the success of the trials, as does the fact that both of them shortly junked the pistons. If it should be ruled that Gulick had no actual reduction to practice in 1911, it would follow also that Long had no actual reduction to practice in 1913. The evidence for Gulick is at least suf-

ficient to establish priority of conception, and if both parties be restricted in their respective early dates of 1911 and 1913 to conception, then Gulick is the first to reduce to practice upon the basis of the pistons similar to his drawing Exhibit 11 which were successfully tried out in a Buda car in the year 1914. That Gulick had a slotted or slit piston when he was associated with Amplex Motor Co. in 1914-1915 is testified to by Hoadley. who installed them, although he testifies to a slot down the center, and a groove below the lower ring (Record, pp. 110-111); he says the sketch, Exhibit 11, looks like the pistons, but this sketch is itself of much later date (Record, pp. 64-65). The testimony of Randall (Record, pp. 152-155) and the stipulated testimony of Duck (pp. 175-176) is stronger and shows that the pistons were successfully used in driving a car with a Buda motor. The date is fixed by the fact that the company went into receivership in November, 1914, and Duck left the company in the spring of 1915. The identify of the invention is primarily dependent upon the recollection of the witnesses.

While the matter is not entirely free from doubt, the burden of establishing priority was upon Long, and it is believed that Gulick has sufficiently proved actual reduction to practice in 1914. But even if Gulick were restricted to his-1917 filing date for reduction to practice he would still be first to reduce to practice. Long has no proofs of actual reduction to practice prior to Gulick's filing date, any better than Gulick's 1914 proofs.

It is held that Gulick is the prior inventor of the subject matter of count 4 being the first to conceive and having probably reduced to practice prior to Long's conception date. In any event, Gulick reduced to practice prior to reduction to practice by Long and would, therefore, be entitled to an award of priority on the ground that he was the first to conceive and the first to reduce to practice.

Priority of invention of the subject matter of the four counts in issue is awarded to Edward J. Gulick, the senior party.

Limit of appeal: August 2, 1928.

H. I. Houston,

Examiner of Interferences.

July 2, 1928.

PLAINTIFFS' EXHIBIT NO. 70-B. Opinion of the Board in Interference No. 49,571. (Filed January 27, 1934.)

Appeal No. 256.

REH

Hearing: May 3, 1929

IN THE UNITED STATES PATENT OFFICE

BEFORE THE BOARD OF APPEALS.

LONG V. GULICK

Patent interference No. 49,571 between the application of Elmer C. Long, filed Nov. 22, 1919, Serial No. 339,892; and application of Edward J. Gulick, filed Nov. 30, 1917, Serial No. 204,661. Pistons.

Messrs. Swan, Frye & Murray for Long. Messrs. Evans & McCoy for Gulick.

This is an appeal from the decision of the Examiner of Interferences by the party Long on the award of priority to the party Gulick.

The invention involved is defined by four counts as follows:

- 1. A piston open at one end and having a packing ring supporting portion and a cylinder engaging portion, said cylinder engaging portion having a slot which is cut through the thickness of its peripheral wall and extending from the open end of the piston to said ring supporting portion, a pair of wrist pin bearings depended from said ring supporting portion, and separated from said cylinder engaging portion, and tying means extending from each of said wrist pin bearings each being cooperably connected at their opposite ends to said cylinder engaging portion.
- 2. A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses connected to the head and to the upper and lower parts of the skirt, said skirt being split longitudinally at one side between its connections to said bosses.
- 3. A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges

in the zone of the bosses and extending from the bosses to the skirt on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections, and the skirt portion being split longitudinally of the piston to permit free expansion and contraction.

4. A one piece piston provided with a solid end portion and a skirt portion, said skirt portion having a longitudinally extending slot formed through the thickness of its wall, said slot extending from the rear edge of the skirt portion and forming adjacent disconnected portions in said skirt portion which are capable of being moved inwardly or outwardly without restraint.

The invention relates to a piston of the split skirt type in which there is yielding means between the head and sections of skirt of the piston and piston pin supports

are carried by the yielding means.

The filing date of the party Gulick is Nov. 30, 1917. The party Long offers testimony which he urges proves conception prior to Gulick's filing date. Long submits no additional brief analyzing the decision of the Examiner of Interferences, and, while Long's counsel was present at the hearing, no specific oral argument was presented along this line. We have carefully considered the decision of the Examiner of Interferences on this point and concur in his decision in holding that the evidence offered did not show conclusively that Long had established a date of conception prior to Gulick's filing date. We also concur in the opinion of the Examiner of Interferences that Gulick proved reduction to practice in 1914.

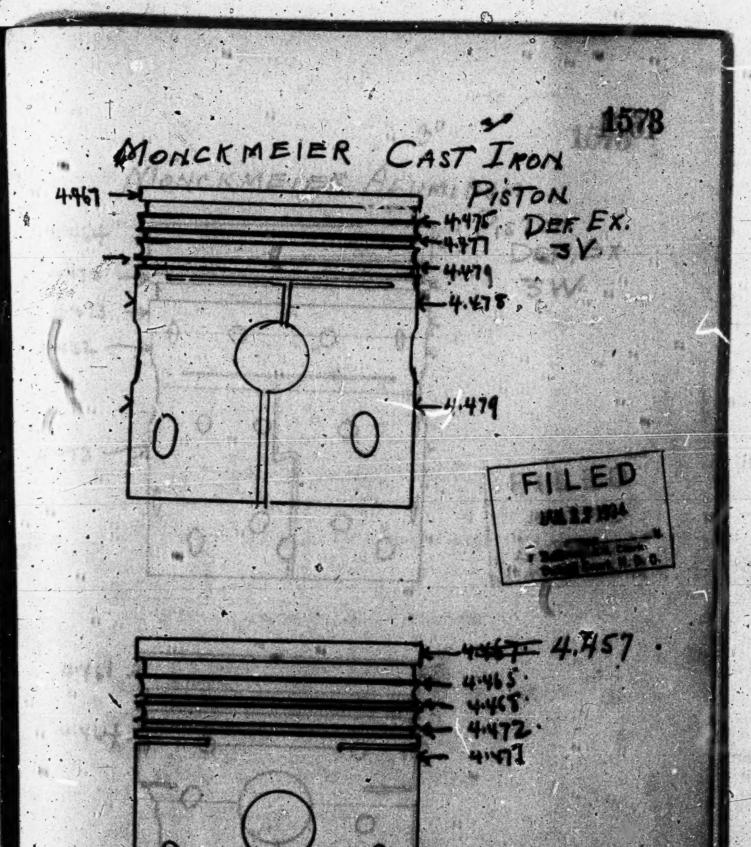
The decision of the Examiner of Interferences is affirmed awarding priority to Edward J. Gulick on the

four counts.

M. J. Moore,
Assistant Commissioner
G. R. Ide,
Examiner-in-Chief
W. L. Thurber,
Examiner-in-Chief

BOARD OF APPEALS.





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PLAINTIFFS' EXHIBIT NO. 84.

Abandoned Application of Ray E. Day for Patent. (Filed January 27, 1934.)

Hearing: March 5, 1924.

IN THE UNITED STATES PATENT OFFICE.

DAY V. LONG V. MAYNARD V. JARDINE V. GULIOK.

PATENT INTERPERENCE No. 49,576.

MOTION TO DISSOLVE.

PIRTONS.

Application of Ray E. Da, filed January 10, 1923, Ser. No. 611.698.

Application of Elmer C. Long filed January 17, 1921, Ser. No. 437,690.

Application of Howard E. Maynard filed January 3, 1921, Ser. No. 434,467.

Application of Frank Jardine filed March 9, 1921, Ser. No. 450,898, renewal of application filed March 11, 1920.

Application of Edward J. Gulick filed November 30, 1917, Ser. No. 204,661.

Mr. Clarence E. Mehlhope for Day. Mr. Herbert G. Fletcher for Long.

Messrs. Whittemore, Hulbert & Whittemore and Mr. J. King Harness for Maynard.

Messre. Richey, Slough and Watts for Jardine.

Mr. Ray S. Gehr for Gulick.

The party Long moves to dissolve on the ground that the count is unpatentable in view of the patents to

Spillman and Mooers, 1,029,870, Apr. 14, 1914,

and

Ebbs, 700,309, May 20, 1902.

The count is as follows:

A piston comprising a head portion, a skirt portion, two separated pin bosses, connecting flanges in the zone of the bosses and extending from the bosses to the select on both sides of the bosses, connecting means from each of the bosses to the head portion, the skirt portion being entirely separated from the head portion except through the boss connections and the skirt portion being split longitudinally of the piston to permit free expansion and contraction and the skirt portion being cut away adjacent the outer ends of the piston bosses.

The Spillman patent shows all the elements of the count except the connecting flanges in the zone of the bosses extending from the bosses to the skirt on both sides of the bosses and the longitudinal split in the skirt

portion.

The first missing limitation would require connecting flanges between the pin bosses 12 and the skirt 2 of the patent substantially above the connections shown in Figures 2 and 3 and in a zone or circumferential belt which would include the bosses. This is a material limitation having a useful function.

The second missing limitation is not new in itself since the Ebbs patent shows a longitudinal split in the skirt but in cooperation with other elements not found in the Ebbs patent, it is a part of a new combination. It is noted that the claim was allowed to Gulick by the primary examiner after consideration of both patents cited.

The count is not satisfactorily anticipated by either reference or any reasonable combination of the refer-

ences.

The motion is denied.

I. P. DISNEY,

Law Examiner.

Apr 4 1924

PLAINTIFFS' EXHIBIT NO. 85.

Oertified Copy of the Drawings of the Abandoned Application of Ray E. Day, filed January 10, 1923, Serial No. 611,698.

(Filed January 27, 1934.)

(Received May 25 1932 Evans & McCoy)

390

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

This is to Century that the annexed is a true copy from the records of this office of the Drawings, in the matter of the Abandoned Application of Ray E. Day, Filed January 10, 1923, Serial Number 611,696, for Improvement in Pistons.

In Terrimony Wheneof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this twenty-first day of May, in the year of our Lord one thousand wine aundred and thirty-two and of the Independence of the United States of America the one hundred and fifty-with.

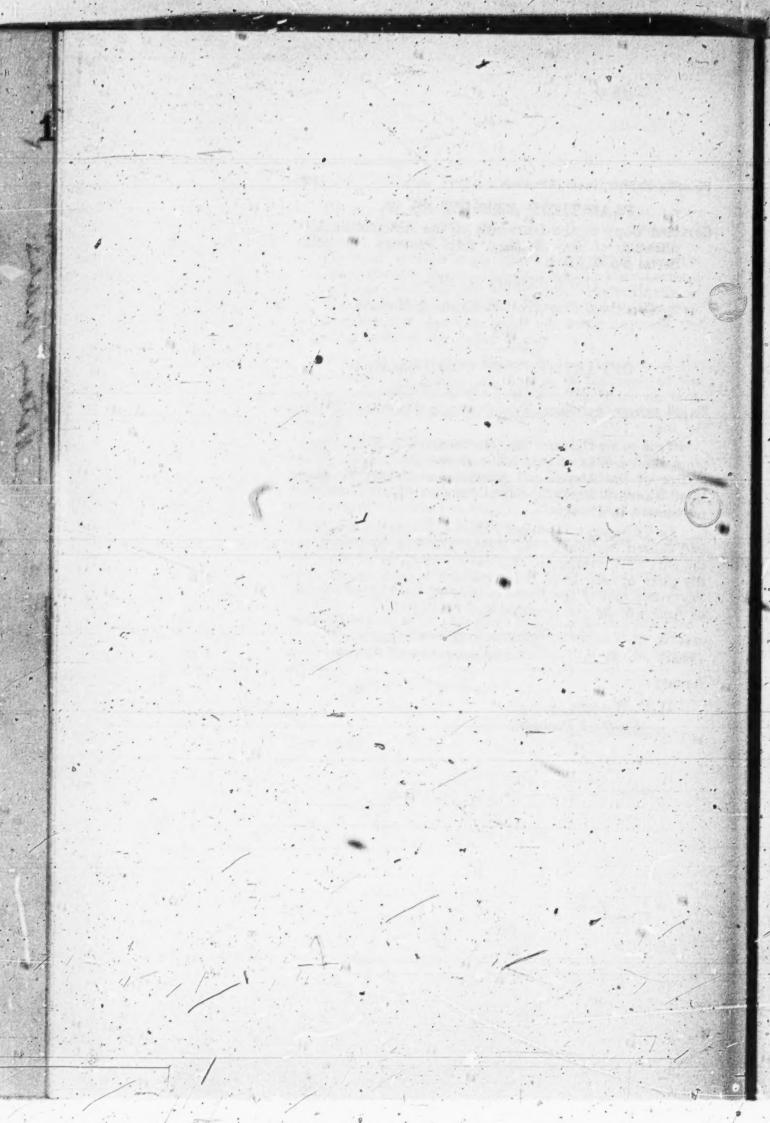
THOMAS E. ROBERTSON,

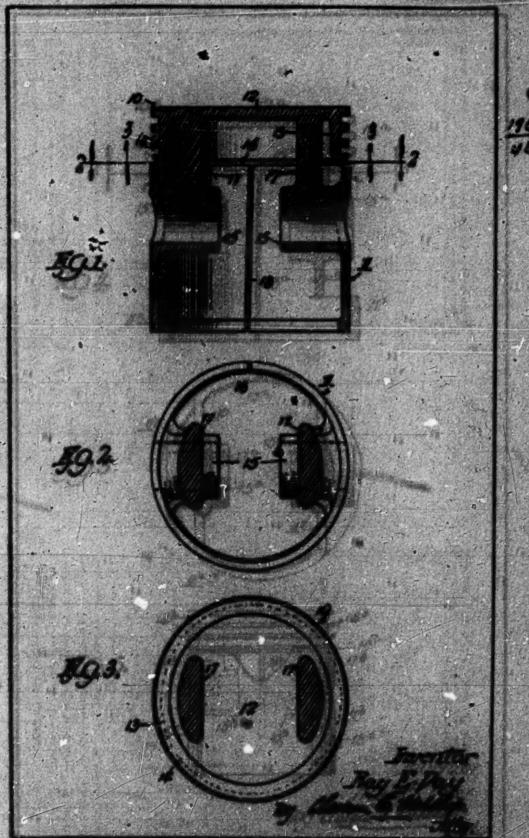
(Seal)

Commissioner of Pivents.

ATTEST:

D. E. WILSON, Chief of Division.



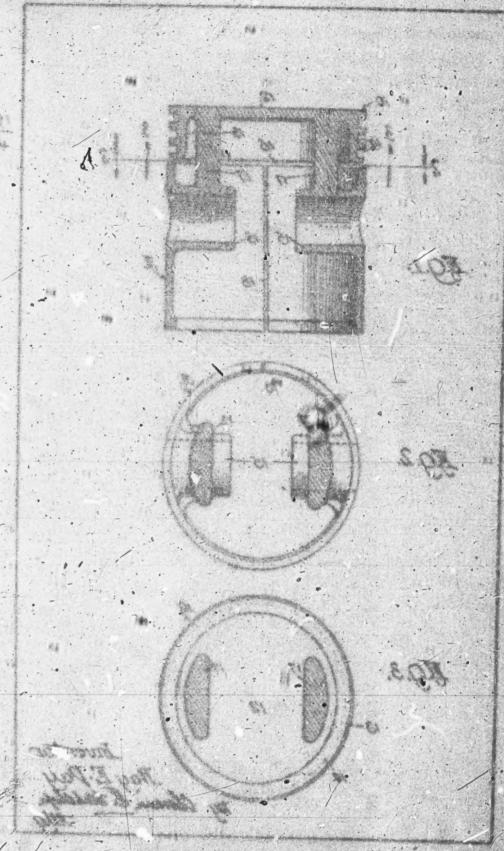


PLANTING SERVICE SO. 80(1).

Dente: of About of Application of Bay B. Day.

(Filed Sec. of 20, 1804.)

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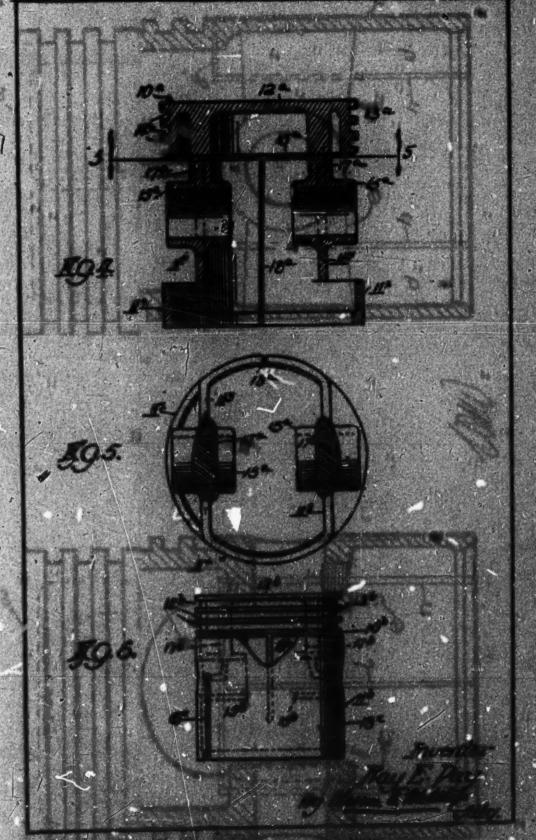


PLAINTIPES' EXCESSIVE NO. 65(2)

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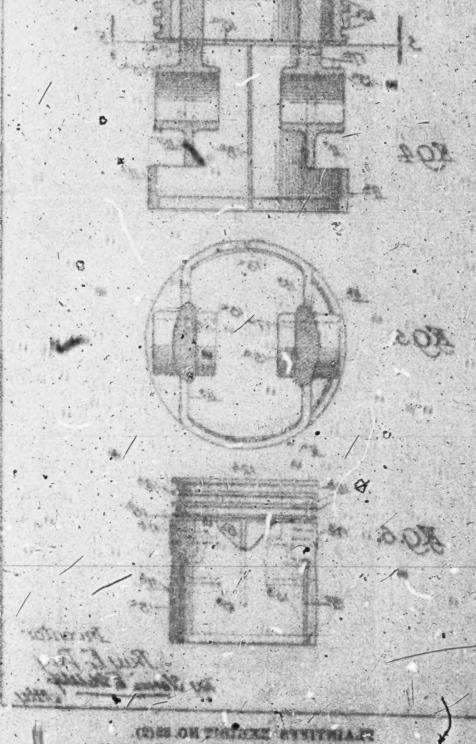
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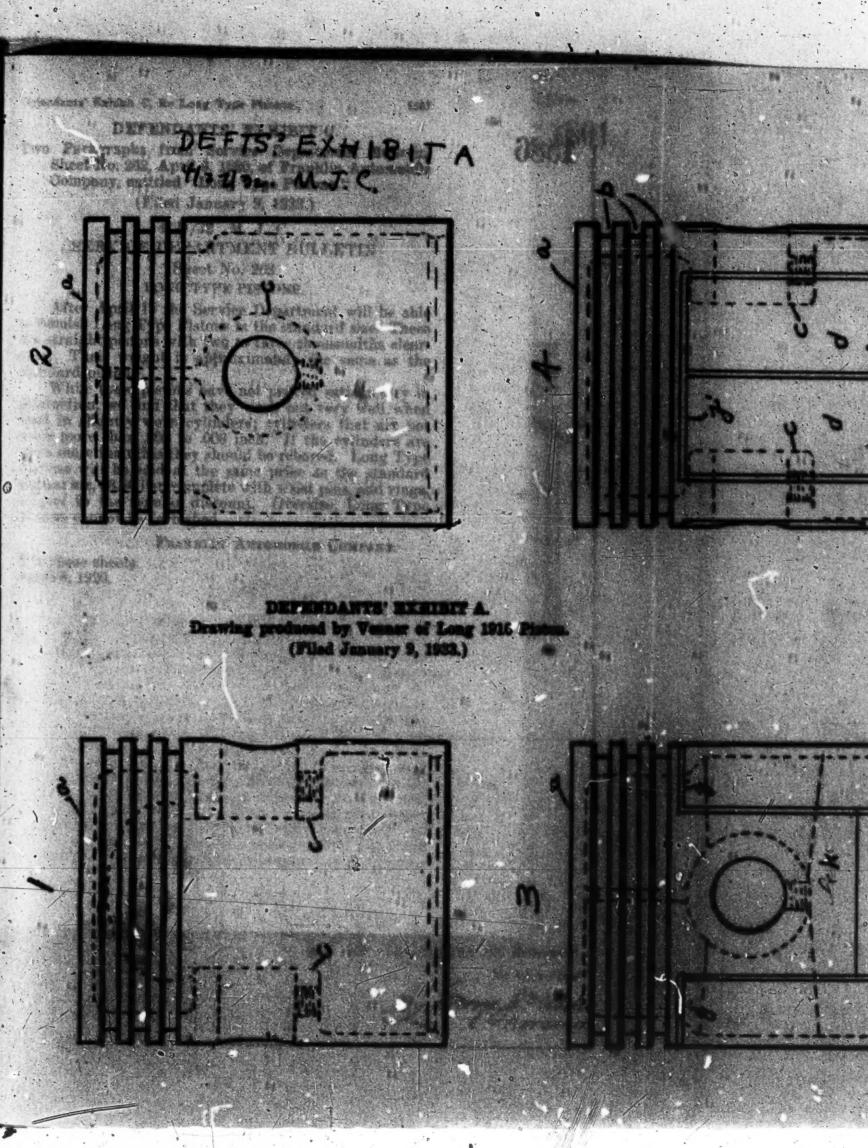
Design Committee of the Party Day

(Pilet January 27, 1984.)

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DEPENDANCE OF COURSE OF

Two Paragraphs from Service Department Bulletin, Sheet Ro. 300, April C. 1980, of Franklin Automobile Company, satisfied "Long Type Pictors."

(Filed January 9, 1933.)

4/27/32 M. J. C.

SERVICE DEPARTMENT BULLETIN

Sheet No. 262 LONG TYPE PISTONS.

After April 15 the Service Department will be able to furnish Long Type Pistons in the standard size. These are straight pistons with two to three thousandths clearance. Their weight is approximately the same as the

While these pistons have not proved satisfactory in production, we find that they work out very well when used in slightly worn cylinders; cylinders that are not worn more than .005 to .006 inch. If the cylinders are worn more than this they should be rebored. Long Type Pistons will be sold at the same price as the standard piston; viz, \$8.50 list, complete with wrist pins, and rings, subject to the regular dispount. Oversize, Long Type pistons cannot be furnished.

FRANKLIN AUTOMOBILE COMPANY.

DEFENDANTS' EXHIBIT D.

Seven Paragraphs from Service Department Bulletin, Sheet No. 289, November 11, 1920, of Franklin Automobile Company, entitled "New Design for Series Nine."

(Filed January 9, 1933.)

SERVICE DEPARTMENT BULLETIN

Sheet No. 289.

NEW DESIGN FOR SERIES NINE

The distinct advantage as a material for pistons which an aluminum alloy with its very light weight and great ability to throw off heat has over cast iron, is con-

ceded by all automobile engineers.

All of the Series 9 cars have been equipped with pistons made from this material and are giving satisfactory service. The Franklin design of these histons as used in the past has been of the most up-to-date. The one disadvantage connected with their use has been the clearance which has been necessary between the pistons and walls of the cylinders.

Aluminum expands with the application of heat much more than cast iron, and for that reason in the past our pistons have required much more clearance to take care of this feature. This excessive clearance, particularly with a cold motor, has a tendency to make it noisy, to say nothing of affording an apportunity for the escape of gasoline past the rings and into the base, and also allowing an excess amount of oil to work up beyond

the rings.

The Franklin engineers, however, realizing the particularly desirable features of the aluminum alloy piston have for the past three years been conducting exhaustive experiments with a view of securing a design such that the undesirable features would be eliminated. That has been accomplished. A new design has been perfected whereby we are now enabled to fit our aluminum pistons with two to three-thousandths clearance. This is the same amount of clearance as would be required for cast iron pistons in Series 9 motors. All motors going through production at this time are being fitted with this new piston known as the Long Piston and a more quiet motor with slightly increased ability is the result.

Fully realizing the fact that with the installation of this Long Piston in Series 9 motors already in service the same improved operation may be obtained to the present owners, the Service Department has made the necessary preparations and is in position to supply this same piston in standard size, and can furnish it to you in the .015" and .030" oversize to take care of the overhaul work.

This new piston is a distinct improvement. We do not contemplate replacing the earlier type pistons in motors already out, except at owners' expense. Sell it to your owners with that idea in mind.

The price is \$6.50 list for piston with wrist pin only.

FRANKLIN AUTOMOBILE COMPANY.

File these Sheets November 11, 1920.

DEFENDANTS' EXHIBIT H.

Article from Franklin Service Bulletin No. 348, April 18, 1932, of Franklin Automobile Company, entitled "The Oval Type Piston,"

(Filed January 27, 1934.)

FRANKLIN SERVICE BULLETIN

"To Reduce the Cost and Improve the Quality of Service"

Franklin Automobile Company, Syracuse, N. Y. No. 348 April 18, 1922

THE OVAL TYPE PISTON

A piston which is ground oval in shape and for this reason known as the oval type piston has been going through production in small quantities since last Summer. The results being obtained with this piston are so successful that it may be adopted for standard production. In order to best understand what the oval type piston is it is necessary to know some of its specifications:

	Oval Type	Long Type
Length of piston	4"	4- 1/16"
Length of piston skirt	. 2-13/16"	2-31/32"
Length of piston above wrist pin.	. 23/2"	2-15/32"
Circumference of piston		round
Shape of piston		straight
Clearance at the diameter perper		
dicular to wrist pin		
At bottom of skirt	003	.005
At top of skirt	005	.005
Clearance in line with wrist pin		
At bottom of skirt	012	.005
At top of skirt		.005
9.6		All to Market 198

The coal type piston has several advantages over the straight and round type of piston. Principal among them are:

1. The oval piston has a clearance of only .003 to .005 of an inch over a distance of 1½ inches omeach side of the piston at the diameter perpendicular to the wrist pin. This gives the oval piston the advantage of a close fit, but the tendency for tightening of the piston of the wrist pin due to friction between the cylinder and piston is avoided because of the much greater clearance at all other points.

2. The increased size of the combustion chamber due to the oval piston being 3/32 of an inch shorter from the center line of the wrist pin to the top of the piston reduces the tendency for

pinging.

DEFENDANTS' EXHIBIT I.

Article from Page 1, Franklin Service Bulletin No. 369, Feb. 20, 1923, of Franklin Automobile Company, entitled Piston and Wrist Pin Knocks, and Drawing on Page 2, entitled "Drill Jig for Extra Oil Holes in Piston."

> (Filed January 3, 1933.) 4/27/32. M.J.C.

FRANKLIN SERVICE BULLETIN

"To Reduce the Cost and Improve the Quality of Service"

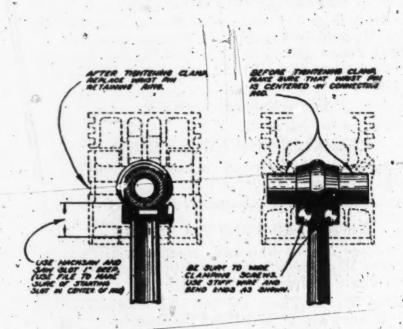
Franklin Automobile Company, Syracuse, N. Y.

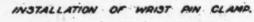
PISTON AND WRIST PIN KNOCKS

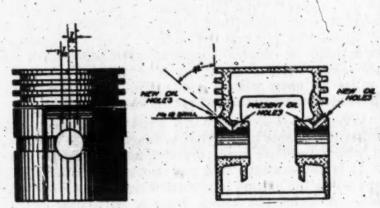
For those dealers who have trouble in distinguishing a piston slap from a knock made by a loose wrist pin, the following descriptions will be helpful.

Piston Slaps.—There are two characteristic piston noises, one known as a "slap" and the other as a "ping." A slap is more noticeable when the engine is cold and tends to disappear when the engine is hot. A "ping" doe not appear until the engine is hot. A slap gives a much sharper noise than a ping, and since a slap usually appears in but one cylinder, it is of less frequency than a ping. A constant application of power at a moderate speed, such as going up a slight incline at 18 or 20 miles an hour with a cool engine, will bring out a slap more distinctly than anything else.

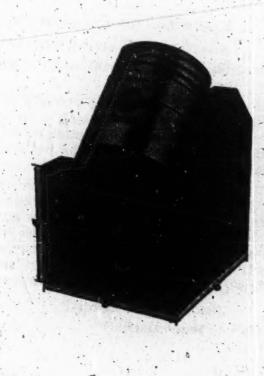
Wrist Pin Knocks.—Worn wrist pins cause a slight but distinct double knock that is heard only at low speed, and which becomes more distinct as the engine warms up. It is not so sharp as a piston slap and can be easily heard when the engine is throttled down to a slow idling speed. A wrist pin knock from a particular cylinder disappears if the compression is relieved by removing the spark plug.







LOCATION OF NEW OIL HOLES IN SERIES IN PISTON.



DEFENDANTS' EXHIBIT J.

Forfeited and Abandoned Application of William M. Venner for Improvement in Pistons, filed April 12, 1920, Serial Number 373,340.

(Filed January 27, 1934.)

390

DEPARTMENT OF COMMERCE

UNITED STATES PATENT OFFICE

To all persons to whom these presents shall come, Greeting:

This is to Certify that the annexed is a true copy from the records of this office of the Petition, Specification, Oath and Drawing, as originally filed, in the matter of the Forfeited and Abandoned Application of William M. Venner, filed April 12, 1920, Serial Number 373, 340, for Improvement in Pistons.

In Testimony Whereof I have hereunto set my hand and caused the seal of the Patent Office to be affixed, at the City of Washington, this sixteenth day of September, in the year of our Lord one thousand nine hundred and thirty-one and of the Independence of the United States of America the one hundred and fifty-sixth.

THOMAS E. ROBERTSON.

(Seal)

Commissioner of Patents.

ATTEST:

D. E. Wilson, Chief of Division,

(Mail Room Apr 12 1920 U. S. Patent Office.) (U. S. I. R. Documentary Stamp 25 Cents.) Application for U. S. Letters Patent

PETITION.

To the Commissioner of Patents:

Your petitioner, William M. Venner, a citizen of the United States, residing at South Bend, in the County of St. Joseph and State of Indiana, and whose post-office address is 316 Hamden Court, in said city, prays that

Letters Patent may be granted to him for the improvement in Pistons set forth in the annexed Specification.

And I hereby appoint George J. Oltsch, 711-12 Studebaker Building, South Bend, Indiana, U. S. A., Register No. 9371, Attorney, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to sign my name to the drawings, to receive the Letters Patent, and to transact all business in the United States Patent Office connected therewith.

Signed at South Bend, in the County of St. Joseph

and State of Indiana, this 8th day of April, 1920.

(Sign here First name in Full.) WILLIAM M. VENNEB.

SPECIFICATION.

To All Whom it May Concern:

BE IT KNOWN, That I, William M. Venner, a citizen of the United States, residing at South Bend, in the County of St. Joseph, and State of Indiana, where invented certain new and useful improvements in Pistons, of which the following is a specification:

The invention relates to pistons and has for its object to provide a piston especially adapted for use

in air cooled internal combustion engines, and to provide a piston so constructed that the use of aluminum and other light metals may be accomplished, thereby giving lightness of reciprocating parts, which metals have a greater relative degree of expansibility than the cylinder casings under the same temperature. Pistons of aluminum and alloys on account of their relative greater degrees of expansibility than the cylinder casings tend to seize the cylinders under high temperatures unless considerable clearance is provided and too much clearance is impractical, as the pistons will slap under low temperature, therefore it is the primary object of the invention to provide a skirt for the piston formed in sections, which sections are supported by downwardly extending webs, which webs are spaced apart at their bottoms and so constructed that they will have a relatively narrow width in proportion to their length so that the expansion of the webs will be more in the direction of their length than width. The lengthwise expansion

being unlimited thereby the web supported skirt sections

will not seize the cylinder.

With the above and other objects in view the invention resides in the combination and arrangement of parts as hereinafter set forth, shown in the drawings, described and claimed, it being understood that changes in the precise embodiment of the invention may be made within

2 373340—2

the scope of what is claimed without departing from the spirit of the invention.

In the drawings:-

Fig. 1 is a side elevation of the piston.

Figure 2 is a vertical sectional view taken on line 2—2 of Figure 1.

Figure 3 is a horizontal sectional view taken on line

3—3 of Figure 2.

Referring to the drawings, the numeral 1 designates a piston and 2 the head thereof. The head 2 is provided with a plurality of piston ring grooves 3 for the reception of piston rings of any conventional form. The piston is made from aluminum or any other light metals, or from any metal which has a greater expansibility than the cylinders in which it may be used. Pistons of this character in the past, on account of their greater expansibility than the cylinders en in which they are used have been found, when subjected to extreme tempera-tures, to bind or seize the bore of the cylinders, and where sufficient clearance has been allowed in the skirt of the piston under low temperatures the piston slaps. To overcome the above object the skirt 4 of the piston is slit as at 5 and 6 so as to form skirt sections 7, which sections form a major area entirely separated from the remaining wall sections 8 of the skirt 4. The adjacent edges of the skirt sections so formed being spaced from each other so as to allow independent movement when the piston is subjected to high or low temperatures.

The head 2 of the piston is provided with a cham-

ber 9 and depending downwardly from said chamber and integrally connected to the head 2 are webs 11 and 12. Webs 11 extend downwardly and are integrally connected to the skirt sections 8 and merge into bearings 13 for the wrist pin. The webs 12 extend downwardly and outwardly and are of greater length than width and have integrally connected to their ends the

skirt sections 7. It will be seen that by having the web sections 12, independent of each other and of greater length than width, that when the piston is subjected to high temperatures the expansion of the webs will be more in the direction of their length than in the direction of their width and that the length-wise expansion may be of any degree without causing the skirt to seize the cylinder. It will also be seen that by having the major area of the skirt in the skirt sections 7 which are entirely separated from the remaining skirt portions 8 and the major area sections 7 being supported entirely by the elongated webs 12 integrally formed with the head 2 of the piston, that the expansion will be longitudinally and not laterally, thereby maintaining a snug fit of the piston as a whole during high or low temperatures so as to overcome the difficulty at present experienced where pistons are made of aluminum or other metals, which have a greater expansibility than the cylinder. By providing supporting webs for the skirt sections, which webs are of greater length than width so that expansion of the webs will be lengthwise, the difficulty heretofore experienced in split skirts for vistons is obviated.

373340-4

The invention having been set forth what is claimed as new and useful is:—

- 1 The combination with a piston head, of a skirt therefor, said skirt being formed from independent sections, and webs carried by the piston head and supporting the independent sections, said webs being of greater length than width, thereby insuring longitudinal expansion and contraction.
- 2 The combination with a piston head, of a skirt therefor, said skirt being formed in sections, some of said sections being carried by the piston head, the other sections being independent, the independent sections being supported by webs carried by the piston head, said webs being of greater length than width so that they will expand and contract longitudinally.
- 3 The combination with a piston head, of a skirt therefor, said skirt being formed in sections, some of said sections being integrally connected to the piston head, the other sections being independent of the piston head, and downwardly extending webs carried by the piston head and supporting the independent sections, said webs being of greater length than width, thereby

causing longitudinal expansion of the webs when subjected to heat.

4 The combination with a piston head, of a skirt therefor, said skirt being formed in sections, some of said sections being carried by and integrally joined to the piston head, the other sections being independent of the piston head, downwardly and outwardly extending webs carried by the piston head and supporting the independent sections, said webs being of greater length than width so as to insure longitudinal expansion and contraction.

373340-5

5 The combination with a piston head, of a skirt therefor, said skirt being formed in sections, some of said sections being carried by the piston head, the other sections being independently supported in relation to the piston head, webs carried by the piston head and supporting the independent sections, said independent sections comprising the major area of the skirt, said webs being of greater length than width thereby insuring longitudinal expansion and contraction.

6 The combination with the head of a piston, of a skirt therefor, said skirt being formed in sections, some of said sections being integrally connected to the piston head, the other sections being independent of the piston head, said independent sections comprising the major area of the skirt, and downwardly extending independent webs for supporting the independent sections, said webs being of greater length than width, thereby insuring longitudinal expansion and contraction.

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IN TESTIMONY WHEREOF I affix my signature.

WILLIAM M. VENNER.
(Sign here First name in Full.)

OATH

State of Indiana, County of St. Joseph, ss:

William M. Venner, the above-named petitioner, being duly sworn, deposes and says that he is a citizen of 1) the United States, and resident of South Bend, Inliana; that he verily believes himself to be the original, irst, and (2) sole inventor of the improvements in Pis-

that he does not know and does not believe that the same was ever known or used before his invention or discovery thereof, or patented or described in any printed publication in any country before his invention or discovery thereof, or more than two years prior to this application, or in public use or on sale in the United Stries for more than two years prior to this application; that said invention has not been patented in any country foreign to the United States on an application filed by him or his legal representatives or assigns more than twelve months prior to this application; and that no application for patent on said improvement has been filed by him or his representatives or assigns in any country foreign to the United States.

(Sign here First name in Full.) WILLIAM M. VENNER.

Sworn to and subscribed before me this 8th day of April, 1920.

OBLO R. DEAHL,

(Official Signature)

Notary Public.

(Official Character)

(Notarial Seal)

[Seal here, to be impressed in paper.]
My commission expires Mar 30, 1921.

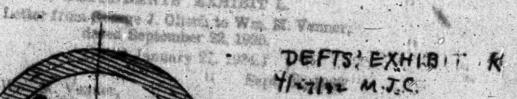
Note.—Acknowledgment should be made before a Notary Public, who must affix his seal. If executed before an officer not provided with a seal, the Certificate of the Judge or Clerk of County Court must be affixed, showing official character of such officer.

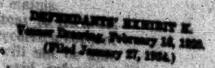
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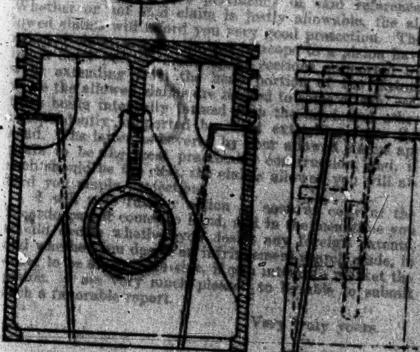
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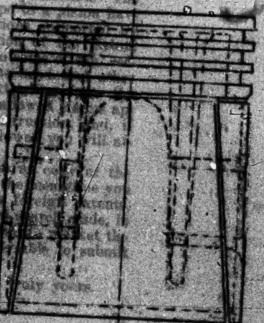


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DEFENDANTS' EXHIBIT L

Letter from George J. Oltsch to Wm. M. Venner, dated September 22, 1920.

(Filed January 27, 1934.)

Sept. 22, 1920.

Mr. Wm. M. Venner, 2217 Locust St. St. Louis, Mo.

Dear Sir :-

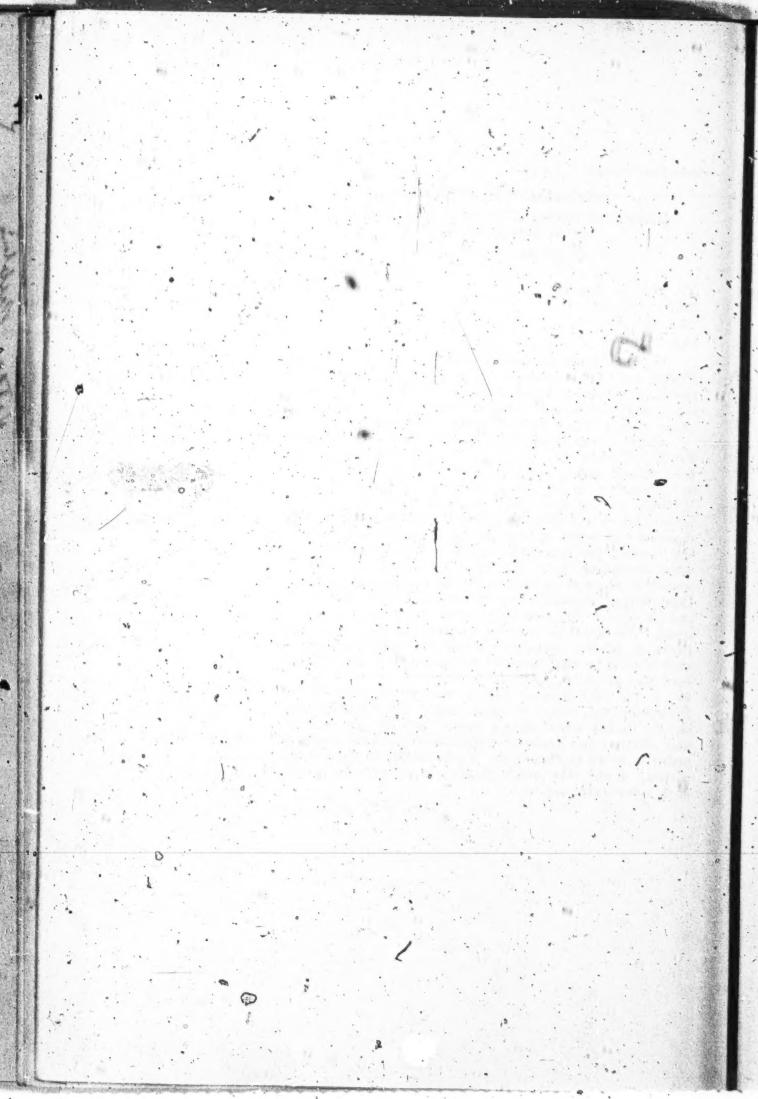
In the matter of your application for a patent on Piston, I am this day in receipt of a communication from the Patent Office advising that all of the claims as originally filed are deemed to be allowable with the exception of one claim, which leaves five allowable claims.

Claim 1 was rejected on British patent to Ricardo, No. 17,953, dated Dec. 23, 1915. Until I receive a copy of this patent, which has been ordered, I will not be able to determine as to the pertinency of said reference. Whether or not said claim is justly allowable, the allowed claims will afford you very good protection. The rejected claim was not limited in scope to a piston having a skirt portion made up of sections supported by webs extending from the head portion of the piston, while the allowed claims are limited to some of said sections being integrally formed with the head, and other independently supported by webs extending from the head. The latter as covered by your allowed claims appears to be the most practicable construction, and, if such should be the case, the claims allowed you will afford you ample protection.

I will take further action as soon as copy of the Ricardo patent comes to hand, and in the meantime you should decide whether you desire any foreign patents, and whether you desire an infringement search made, in order to be on the safe side, if you intend to market the piston. I am very much pleased to be able to submit

such a favorable report.

Very truly yours.



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. DEPENDANTS BESIDER W.

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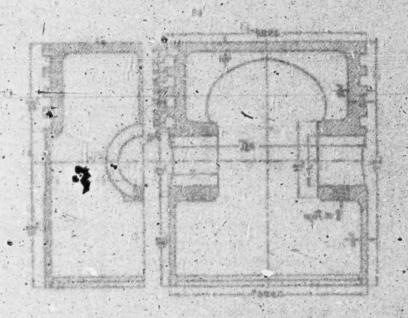
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Photostat of page 143 showing One safe is The Gasoline Automobile," by Kobit Vol. 1.
(Filed Jundays 27, 1924)

DEPENDANTS' EXHIBIT N.

Article from Pages 8 and 9 of Manual for Trouble Shooters of Franklin Automobile Company, entitled "Piston Slap."

(Filed January 27, 1934.)

PISTON SLAP

A slap is more noticeable when the engine is cold and tends to disappear when the engine is not. It gives a much sharper noise than a "ping" and since a slap usually appears in but one cylinder, it is of less frequency than a ping. A constant application of power at a moderate speed, such as going up a slight incline at 18 or 20 miles an hour with a cool engine, will bring out a slap

more distinctly than anything else.

Slaps are due to the clearance allowed between the piston and the cylinder walls. A certain amount of clear-ance is necessary to take care of the expansion of the heated piston. (A piston gets hotter and expands more than a cylinder.) Aluminum pistons expand more than cast-iron or steel ones and since this extra expansion requires more clearance, they are more apt to slap. A slap that disappears after an engine is warmed up can do no harm and it is a waste of money to try to eliminate it. Often when such a slap is removed from one cylinder it will appear in another.

Three types of pistons have been used in Series 9 and 10 engines, "tapered," "straight," and "oval."

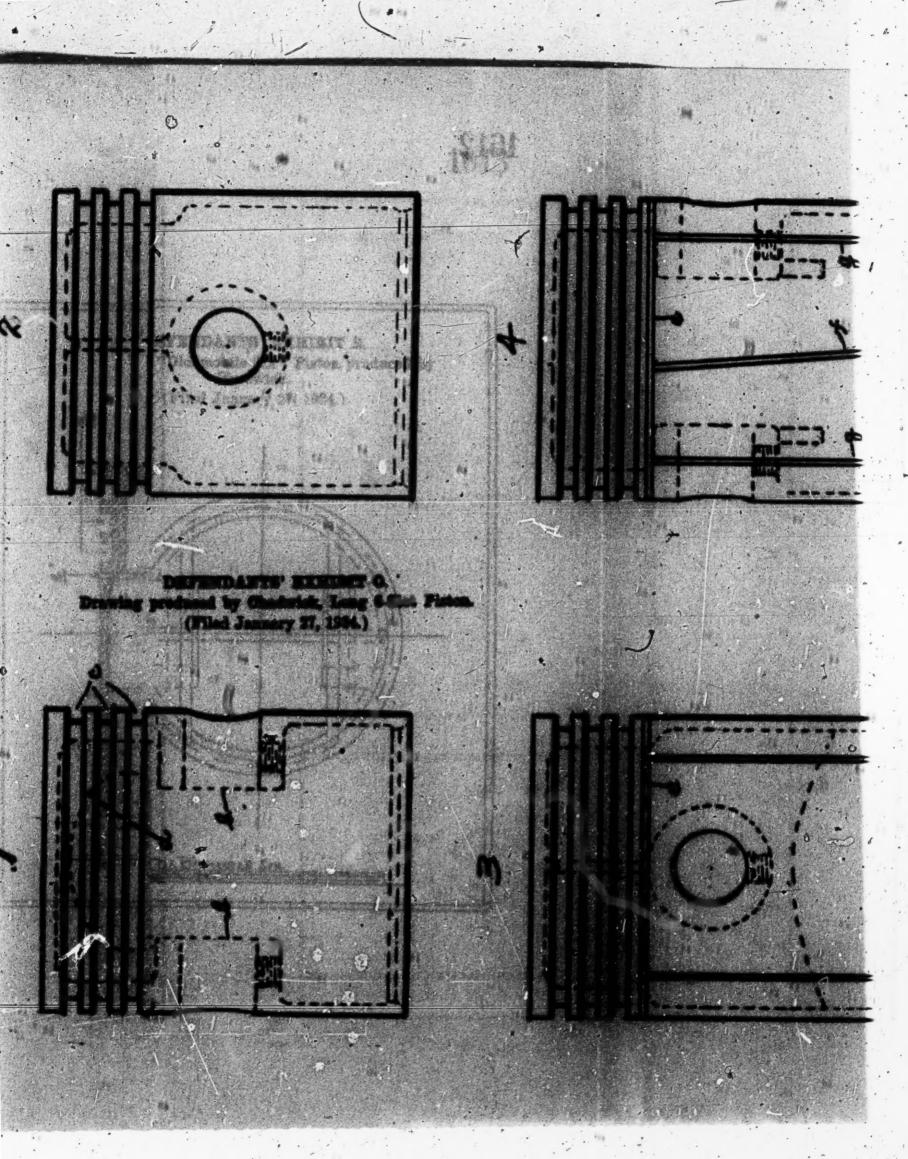
The proper clearances for these are as follows:

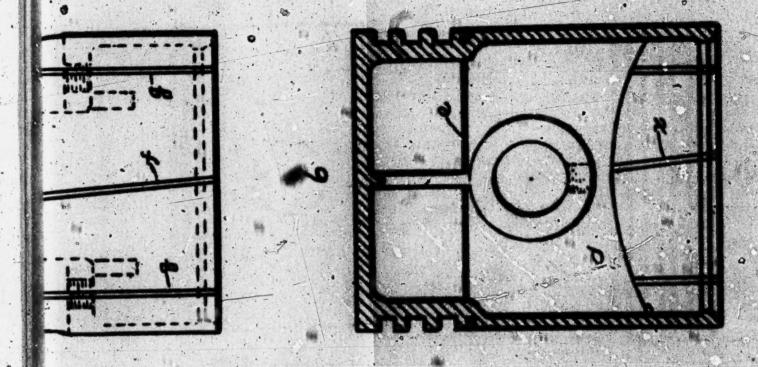
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Piston	ALC: NO.	TOP OF S	ARE DESCRIPTION OF LINES WILLIAM	TOM OF SKIRT
Tapered	4 2 2 2	.008*	Comment of the Control of the	.003"
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Oval		.005	200 200 200 200 200 200 200 200 200 200	.003"

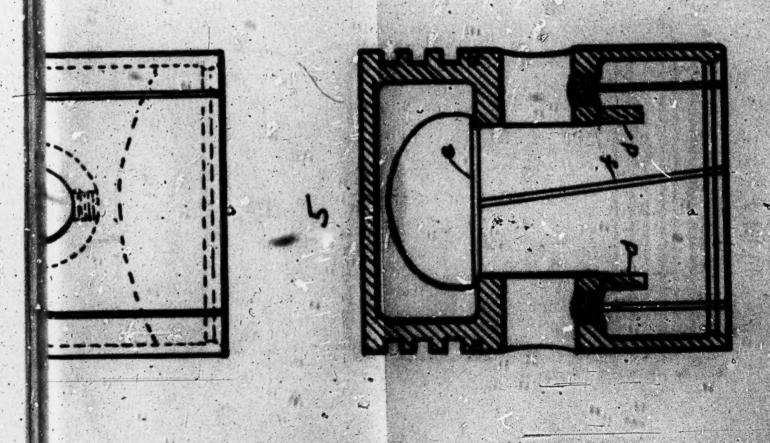
The original clearance of a piston and cylinder is given by the figures stamped on the head of the piston and on the bottom of the cylinder flange.

To determine which piston is slapping, run the engine at the speed at which the slap is most noticeable and then short circuit the spark plugs one at a time-with a screw-driver. When the slapping cylinder is short circuited, the slap will be much less noticeable or will disappear entirely. Another method of locating a slap is to have the engine idling and then to open the throttle in short, sudden jabs, feeling each cylinder with the point

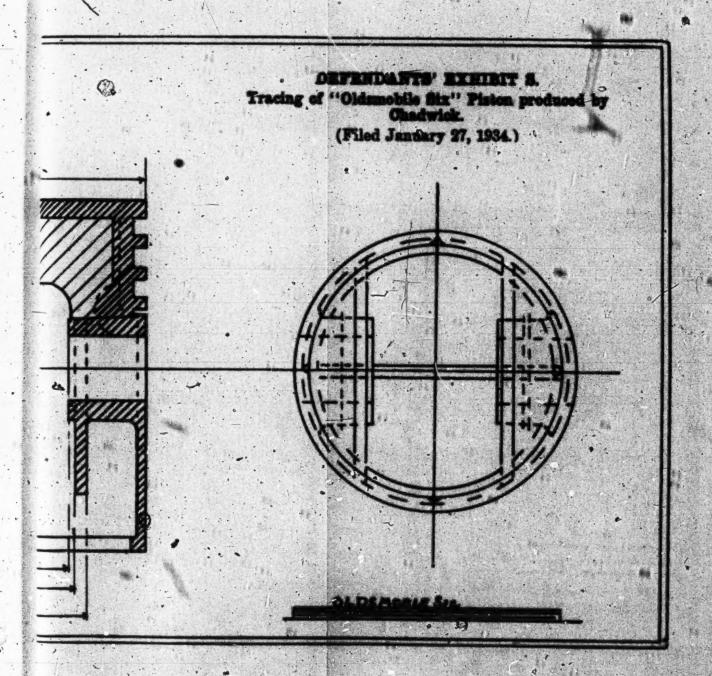
of a small screw-driver held just under the cooling fins as this is done. A distinct tap can be felt on the slapping cylinder. Another method is to use a long screw-driver as a "listening rod," placing the blade of the screw-driver against the cylinder and the handle against the ear. [The only remedy for a slapping piston is to install a larger piston or a smaller cylinder. If the cylinder should be too badly worn (over .005") to install a new piston, the cylinder can be reground by the factory for a nominal charge and an oversize piston installed.]

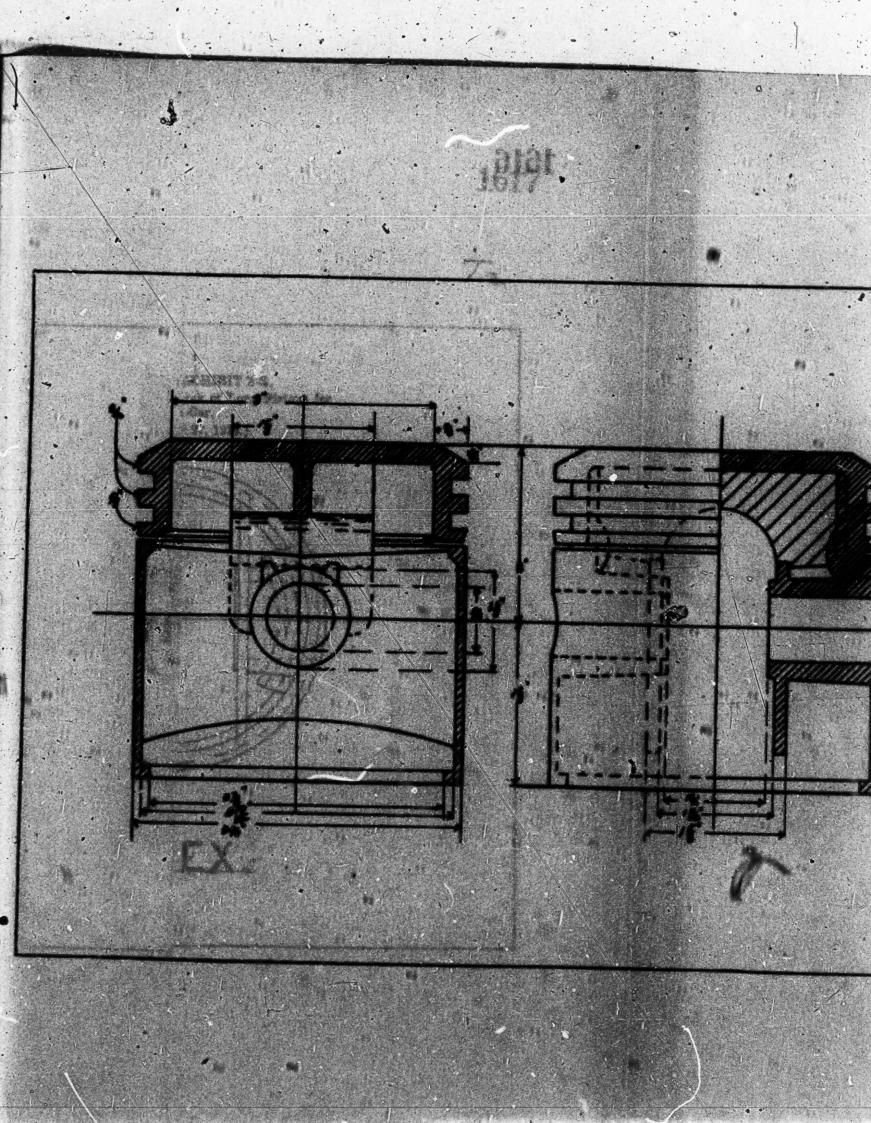




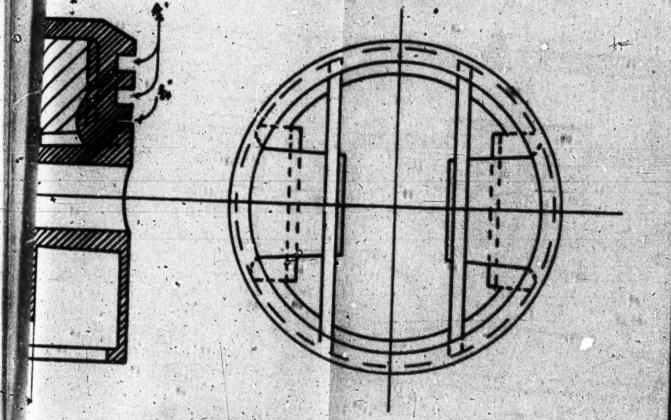


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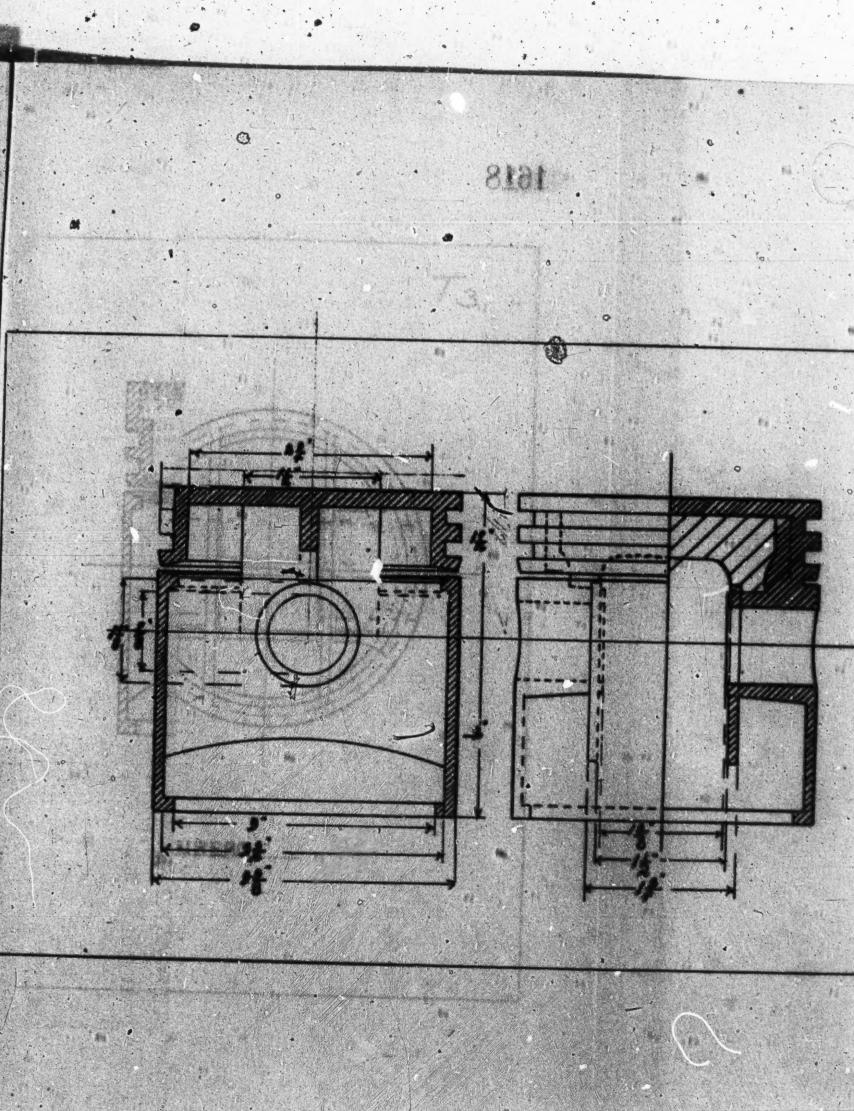




DEFENDANTS' EXHIBIT T.L. Freeing produced by Chadwick of Long Platons for Furd, Hodel T Car. (Filed January 27, 1994.)



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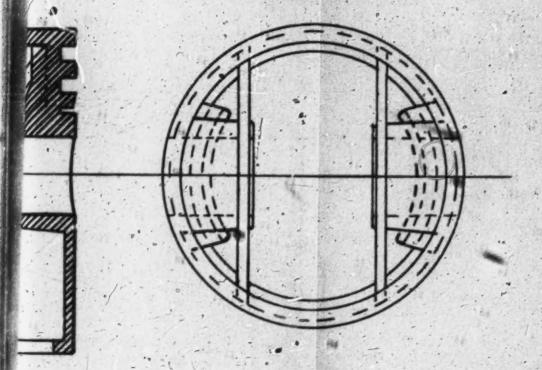


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DEPENDANTS' EXHIBIT T-2.

Tracing produced by Chadwick of Long Pistons for an House Car.

(Piled January 27, 1984.)



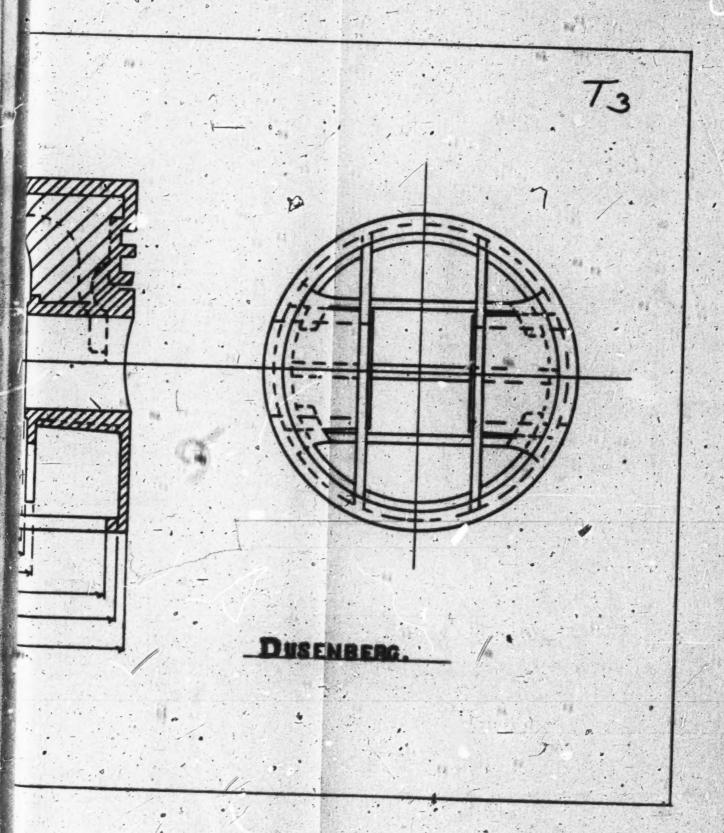
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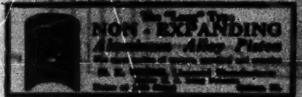
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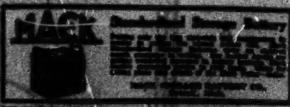
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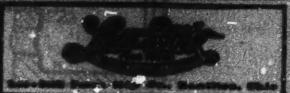












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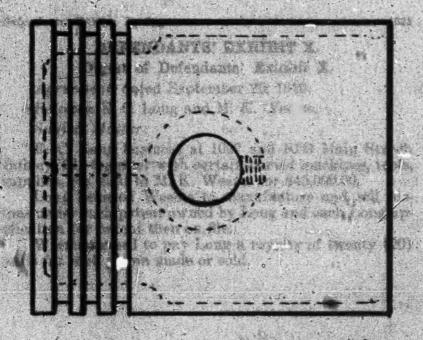
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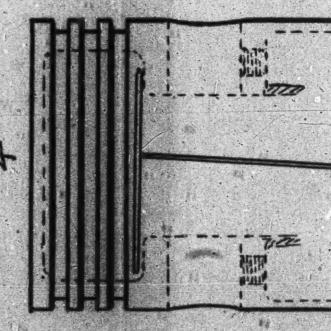
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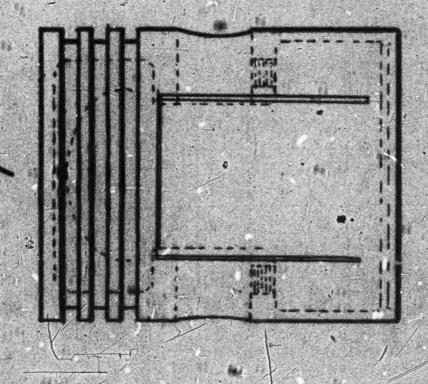


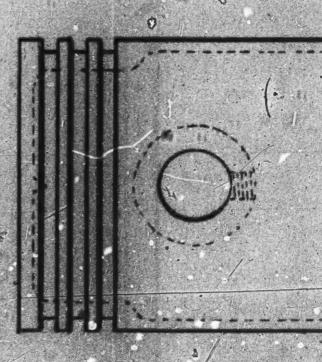


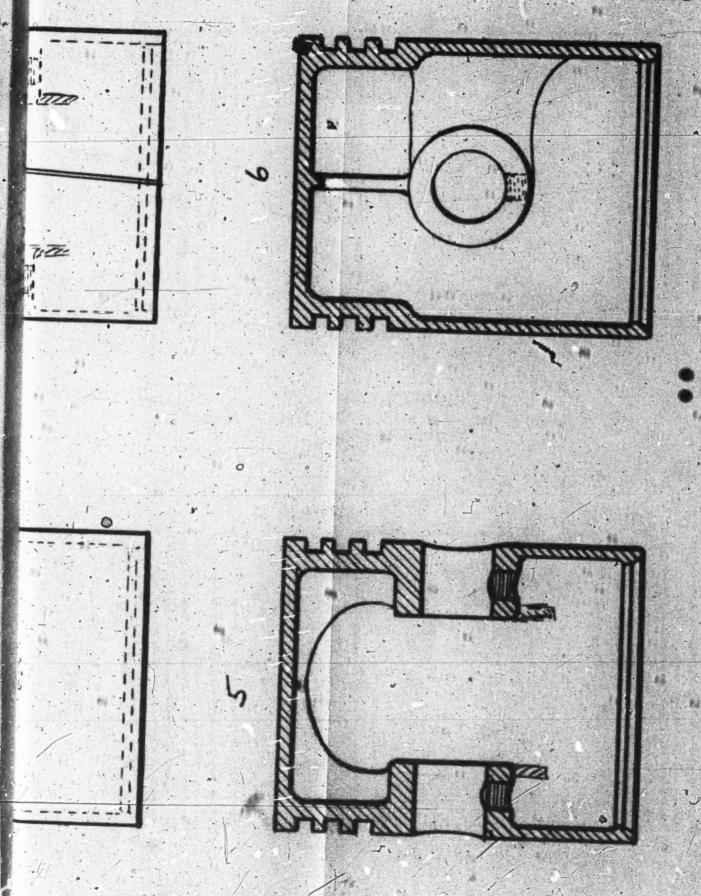
DEFENDANTS' EXHIBIT W.

Photostat of Trunk Piston added to by Chadwick to show
T-alot Long Piston.

(Filed January 27, 1934.)







DEFENDANTS' EXHIBIT X.

Digest of Defendants' Exhibit X.

Agreement, dated September 20, 1919.

Between E. C. Long and M. K. Weems

Subject Matter:

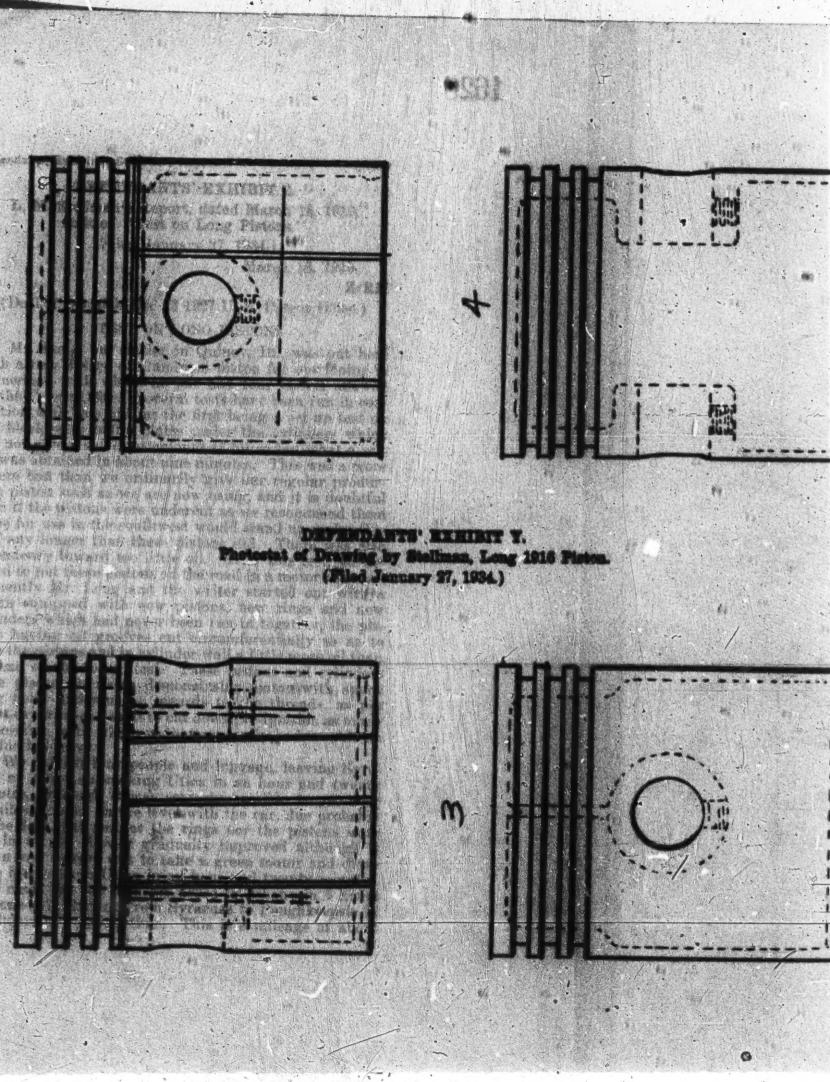
E. C. Long business at 1037 and 1039 Main Street, Quincy, Ill., together with certain named machines, tools, supplies, etc. sold to M. K. Weems for \$45,000.00.

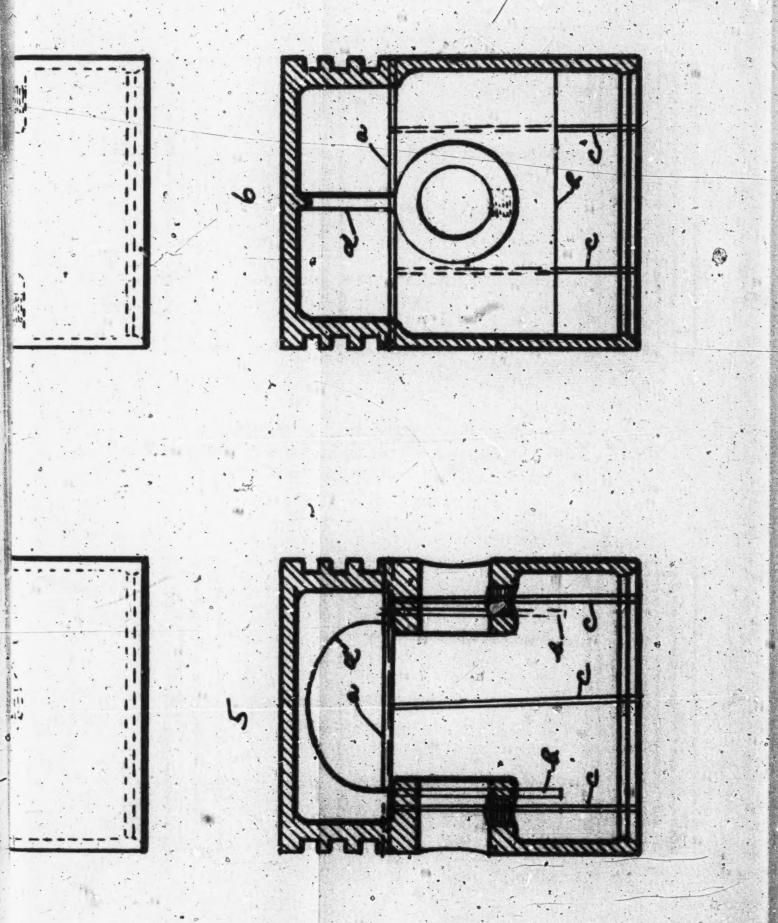
Long licensed Weems to manufacture and sell pistons under each patent owned by Long and each Long application for patent then on file.

Weems agreed to pay Long a royalty of twenty (20)

cents for each piston made or sold.







DEFENDANTS' EXHIBIT Z.

L. M. Stellman's Report, dated March 18, 1919, entitled "Test on Long Pistons."

(Filed January 27, 1934.)

March 18, 1919.

· Z/RM

(Docket Division Dec 23 1927'U. S. Patent Office.)

TEST ON LONG PISTONS

Mr. Long, our dealer in Quincy, Ill., was out here with a new design of aluminum fiston for our motor in connection with which he has had four claims allowed by the Patent Office. Several tests have been run in connection with this piston; the first being a set-up test on the block with baffle plates under the cylinders which did not give a sufficient amount of oil so but what a setup was obtained in about nine minutes. This was a more severe test than we ordinarily give our regular production piston such as we are now using, and it is doubtful even if the pistons were undercut as we recommend them to be for use in the southwest would stand up under this test any longer than these pistons did. There was also a tendency toward too little oil. After this test, we decided to put these pistons on the road in a motor and consequently Mr. Long and the writer started out with a sedan equipped with new pistons, new rings and new cylinders which had never been run in together, the pistons having oil grooves cut circumferentially so as to give the pistons and in cylinder wall a little more oil than we had on the set-up test. These pistons and cylinders were placed on sedan demonstrator motor with spark plug holes undercut as regards to the threads, as per latest experiments, so as to cut down pre-ignition as much as possible, with which we have recently had trouble on production cars.

We carried four people and luggage, leaving Syracuse at 2:30 p.m., making Utica in an hour and twenty minutes, although it was scarcely possible to get over 40 miles an hour on the level with the ear, due probably to the fact that neither the rings nor the pistons were run in at all. Power gradually improved although it was a very severe test to take a green motor and drive from Syracuse to Utica in an hour and twenty minutes. Also made the run from Syracuse to Albany in 4 hours and one-half, driving from Syracuse to Poughkeepsie in 634 hours of running time. This is a mileage of about

240 miles. During this comparatively high speed, the car got so it would hold 45 miles on the level continuously. One quart of oil was consumed in the total 240 miles. This oil consumption is very low, considering the speed which the car made. It has been the writer's experience that a normal production car would consume approximately one gallon of oil under the same conditions.

The run was continued to New York the next day where a day was spent at the Aeronautical Show. The next morning the oil was drawn off from the engine base. washed out, new oil put in, and we left Columbus Circle at 9 a.m., driving up through Connecticut, through Bridgeport, New Haven to Hartford, making 125 miles in 31/2 hours. On this run, there was considerable comparatively level straight road and the car would hold 50 miles an hour against a slight head wind. During this run the Franklin kept ahead of a Cadillac coupe which was evidently bent on beating us to Hartford. After reaching Hartford, it was decided that it was practically impossible to set this car up under normal conditions on the level under temperatures encountered which were fairly cool, even though hot air was used both on suction yoke manifold and carburetor intake. Therefore we decided to take the car up into the Vermont hills through mud roads. We drove the car 120 miles on low and second gear work over roads that were axle deep with mud, so deep that we scraped the flywheel boot off. While it was possible to get the motor to pre-ignite so that the engine would lose power badly and it would be necessary to drop into a lower gear; as soon as this was done, the engine speed was allowed to pick up, pre-ignition would disappear and the motor would run apparently in excellent shape. With regular production motor or cast iron pistons if pre-ignition was obtained as it was in this car, the motor would, in the writer's opinion set up when shifted to lower gear and speed increased. During this 120 mile drive in the mud, sedan was carrying one thousand pounds dead load. The remainder of the trip was completed back to Syracuse over the Mohawk trail, coming up the long grade on the east side of Hoosick Mountain with about 3" of soft snow. The whole grade was negotiated in second gear except when the pre-ignition got so great that it was necessary to drop into low gear for a short period of time. The last 150 miles was run in 41/4 hours running time. The total oil consumption from the time we left New York, during all our low and

second gear and hard work, was at the rate of 680 miles

to the gallon.

From this test it would look as if it might be desirable to change the baffle plates slightly from those used on this motor so as to allow the motor to use more oil at low speeds. The gasoline consumption for the total 970 miles averaged 15 miles to the gallon which would seem to be very good considering the speed and the condition of the roads. It seems to the writer as if this piston was operating satisfactorily and would run in a perfectly satisfactory manner. The only question would be as to how the performance in regard to pre-ignition and loss of power would be in the southwest where the temperatures encountered are considerably higher. On examining the pistons after the motor was torn down. there was no trouble encountered with scores or roughness on the piston, but the cylinders were slightly scored in a vertical direction. This probably was due to starting the motor out and running under extremely hard conditions without first running pistons and cylinders together.

L. M. STELLMAN.

DEFENDANTS' EXHIBIT AA. Digest of Defendants' Exhibit AA.

License Agreement, dated March 20th, 1919.

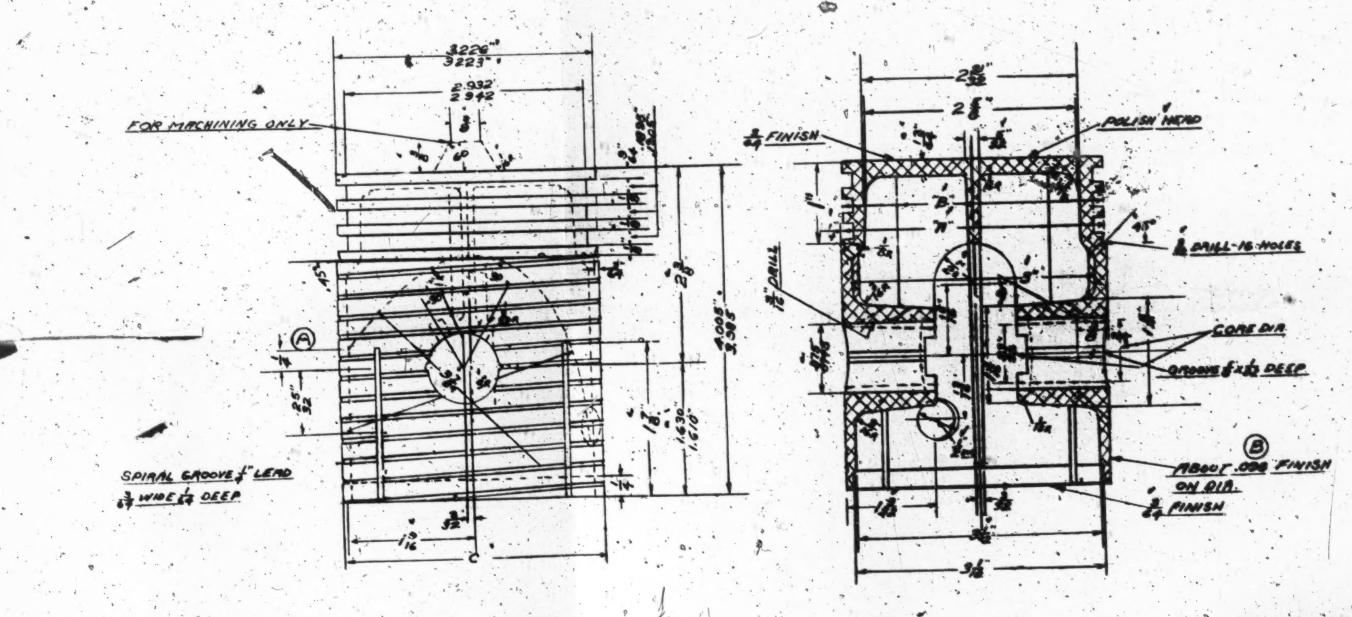
Between Elmer C. Long of Quincy, Illinois, and the H. H. Franklin Manufacturing Company, of Syracuse, New York.

Subject Matter:

Elmer C. Long grants a non-exclusive license to the Franklin Company under Long Application for Patent, Serial No. 281,175 and under all patents and applications

owned or thereafter acquired by Long.

The Franklin Company agrees to pay Long a royalty of twenty (20) cents for each of the first thirty thousand (30,000) pistons made and sold, fifteen (15) cents for each of the next thirty thousand (30,000) pistons made and sold, and ten (10) cents for each piston made and sold thereafter.



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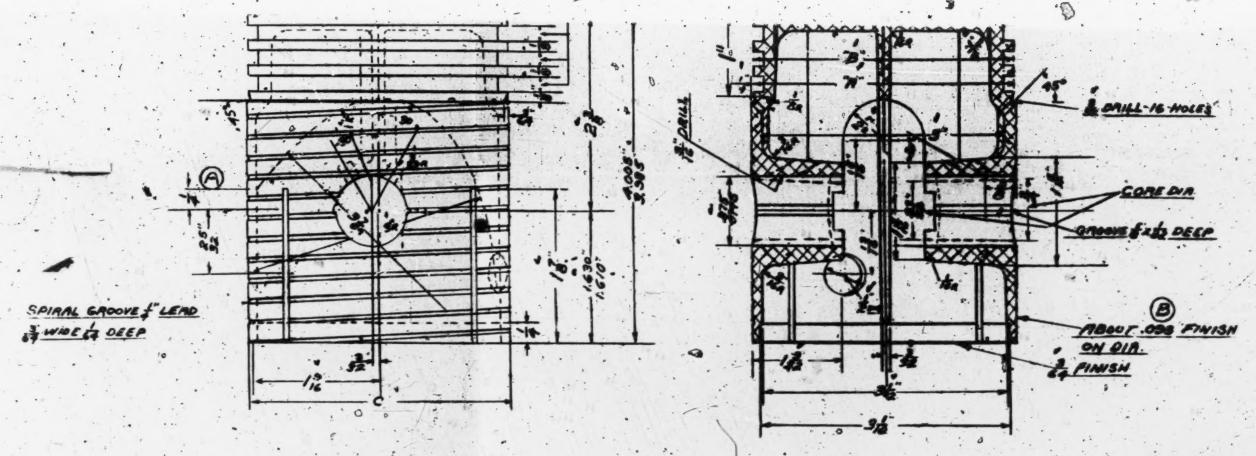
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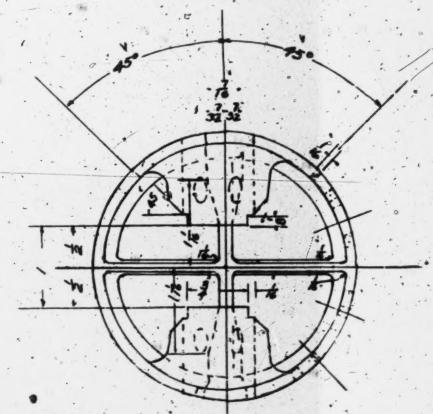
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DEPENDANTS' EXHIBIT OO'(1).

Blusprint D-793X of The Aluminum Castings Co. (Drawing of Proposed Design of Piston for H. H. Franklin Mig. Co.

(Filed January 27, 1934.)

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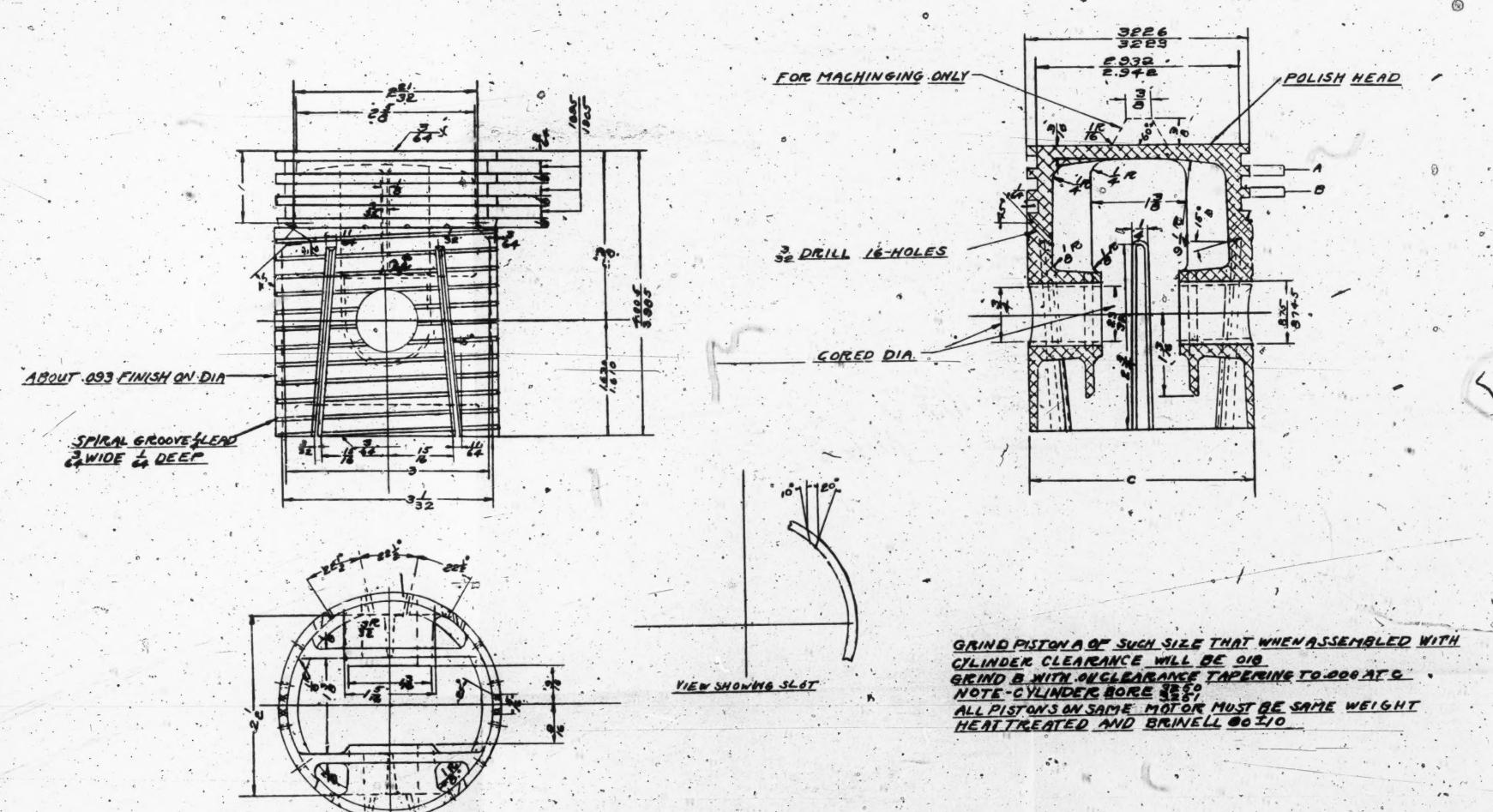
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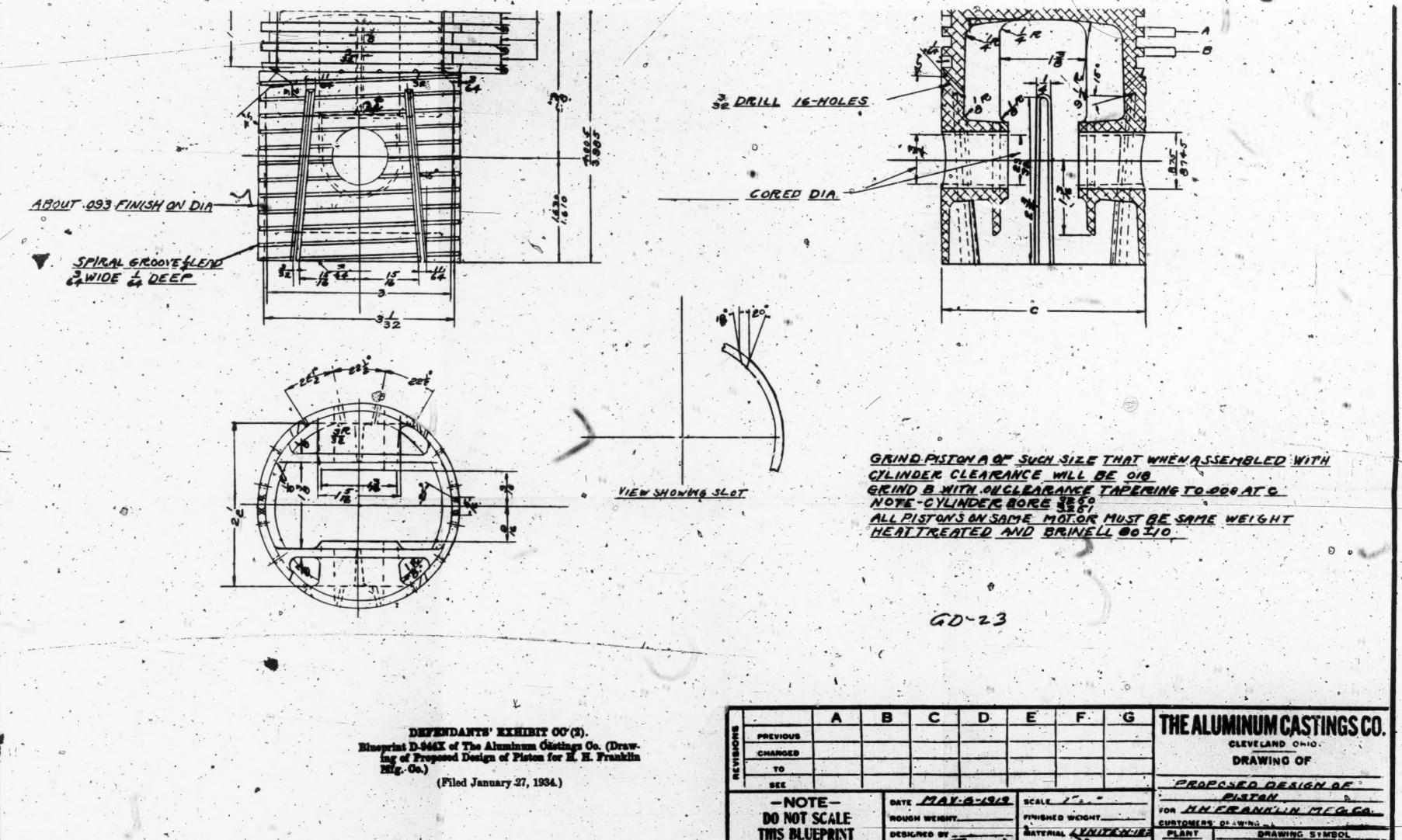
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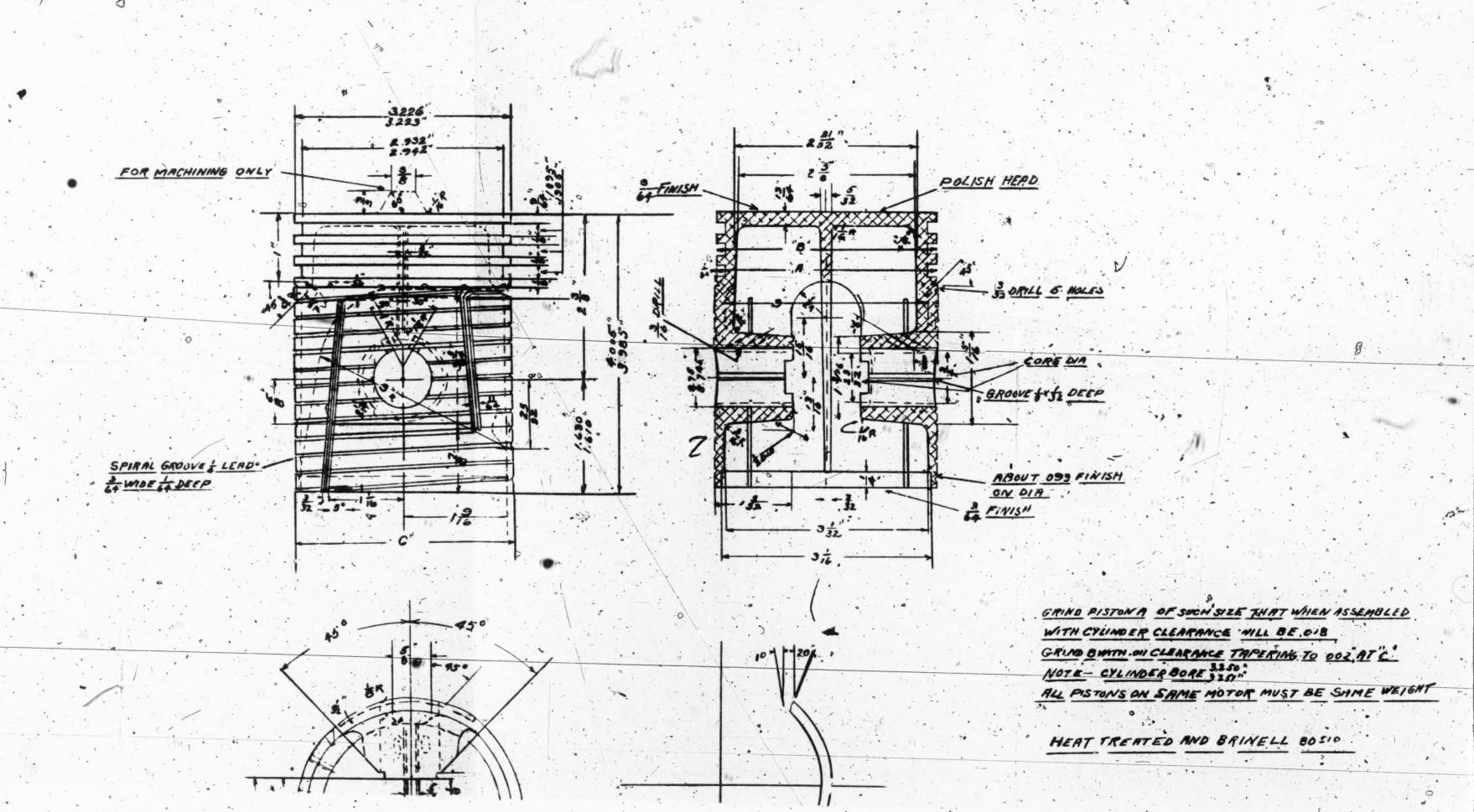
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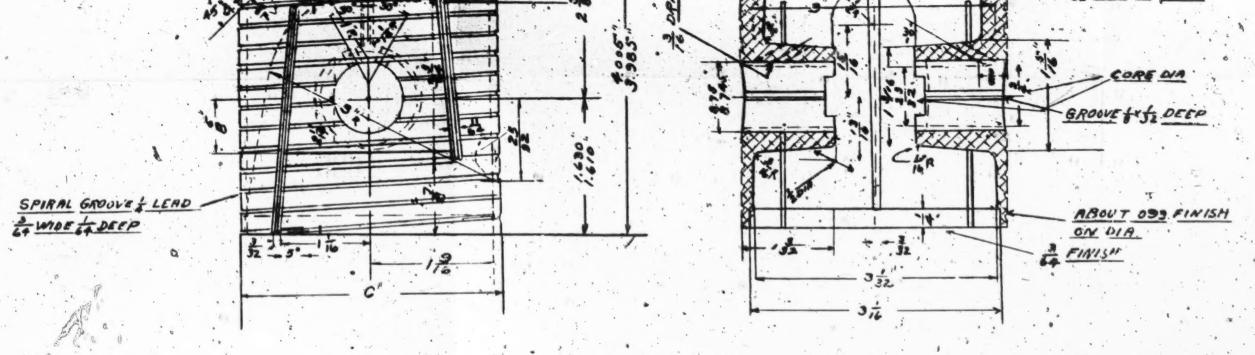


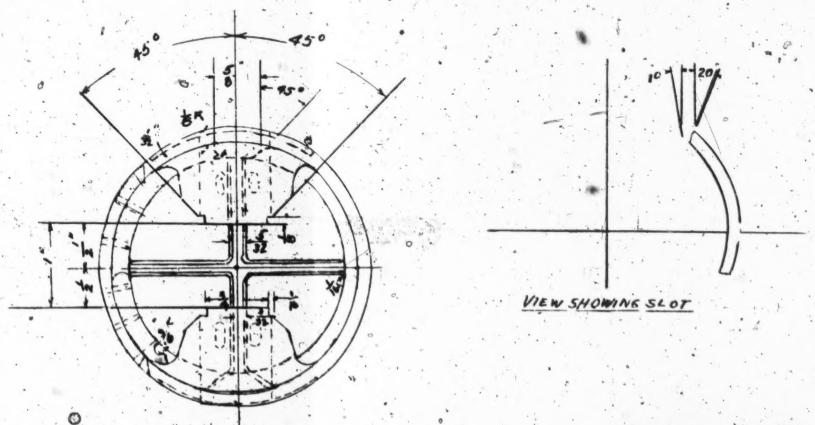


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DEFENDANTS' EXHIBIT OO'(3).

Blueprint D-960X of The Aluminum Castings Co. (Drawing of Proposed Design of Piston for H. H. Franklin Mfg. Co.)

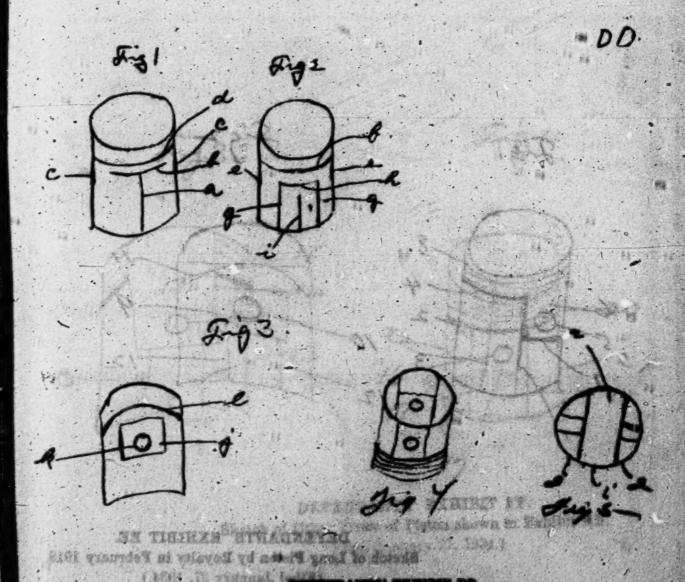
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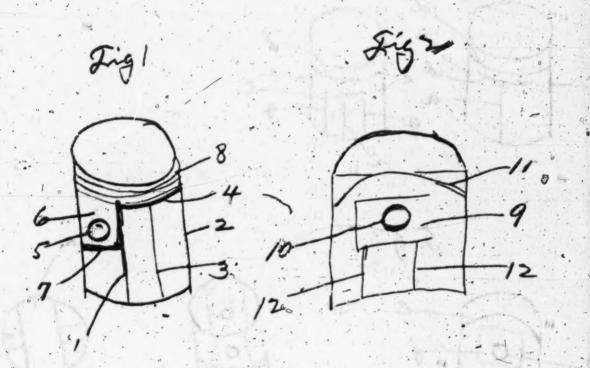
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(Filed January 27, 1994.)

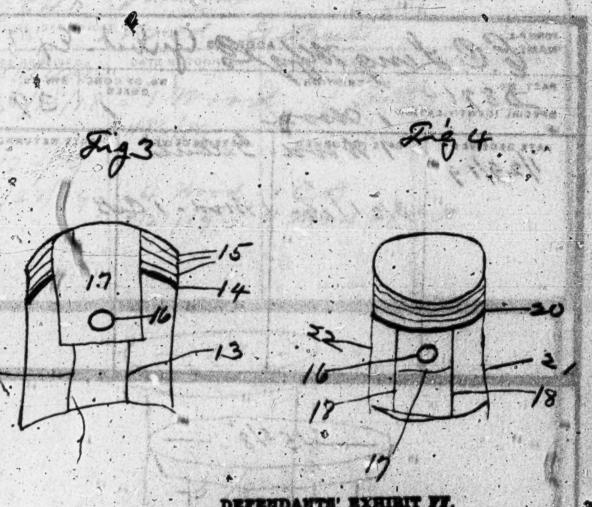


DEPENDANTS' EXHIBIT EE.

Sketch of Long Piston by Royalty in February 1918.

(Filed January 27, 1934.)

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DEPENDANTS' EXHIBIT FF.
Sketch of Other Views of Piston shown in Exhibit EE
(Filed January 27, 1934.)

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Photostat of Pattern Record Card marked D.8784
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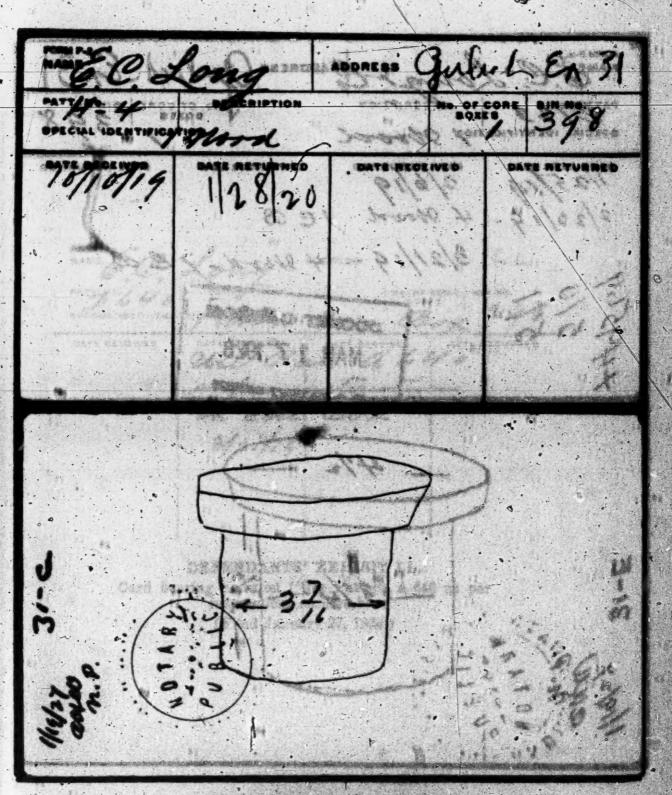
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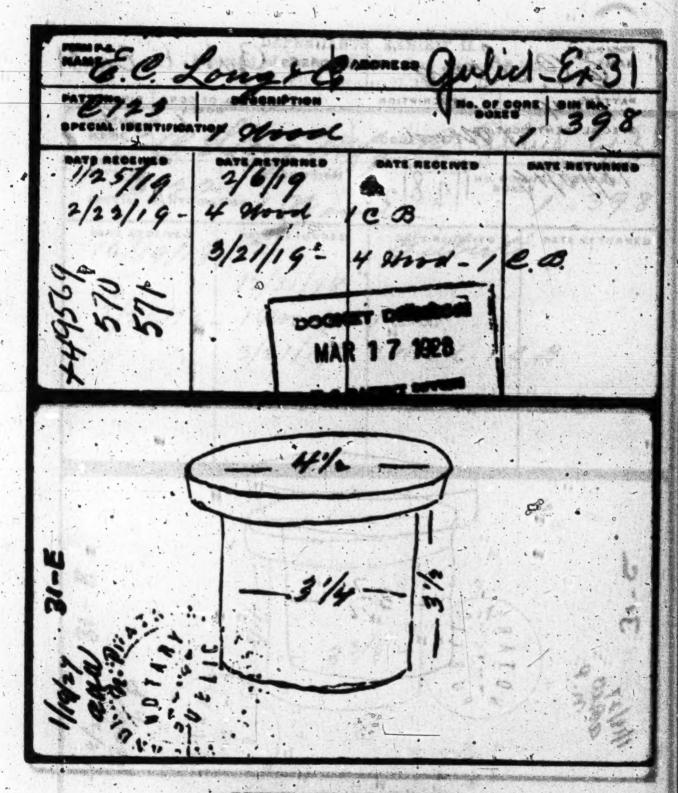
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DEFENDANTS' EXHIBIT II. Photostat c: Pattern Record Card marked B-122. (Filed January 27, 1934.)

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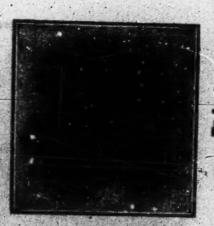
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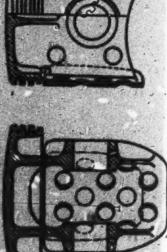
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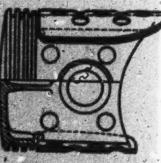
Card bearing designation, "Patt. No. A-641."
(Filed January 27, 1934.)

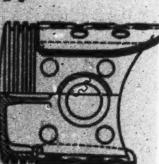
DESIGN. **PISTON**

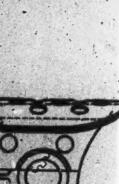
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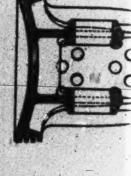












of the lubricant.

(c.) To reduce the oil consumption and free vent for the lubricant, and thus preventing it from being "rolled up" between the piston and cylinder walls, which was found to be the chief cause of oil tion chamber reaching the comb

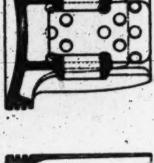
gudgeon pin itself and the small end bearing of the connecting rod constitute a weight.
This piston, however, in common with weight of the light pistons the these very

considerable allowance for expansion, with to be somewhat noisy when In order to reduce the the result that it is liable all other aluminium pistons, requires

Such a piston of 4in. bore is shown in fig. r. Several of these pistons have been in use in motor car engines, and their quiet running has been most noticeable.

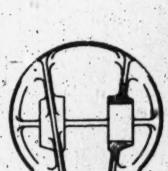
Fig. 2 shows a further development, in which the bearing surface on the side for the ordinary type, and to little, if any, more than is required for a cast iron piston.

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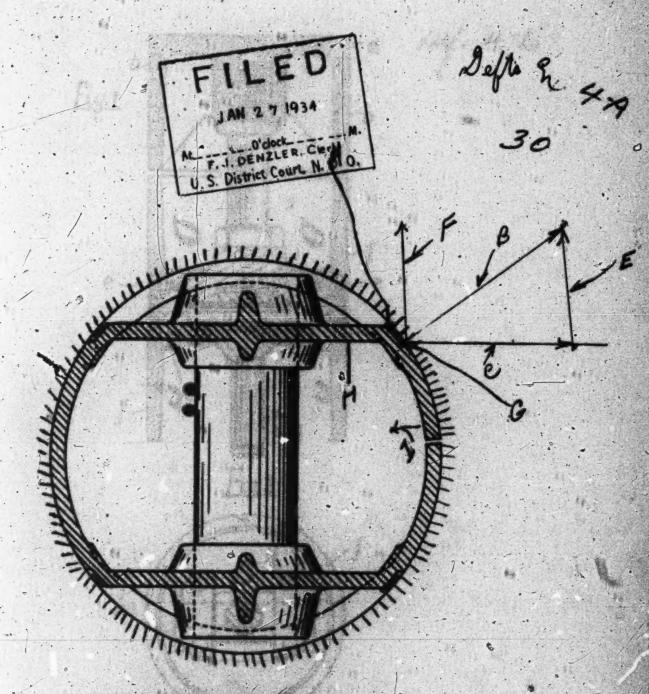
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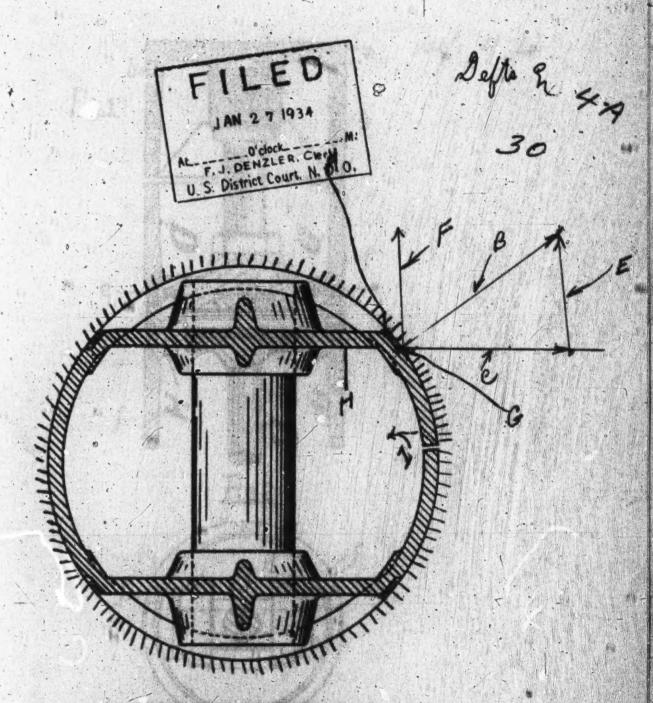
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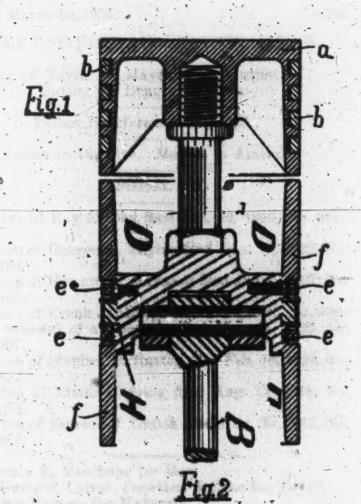
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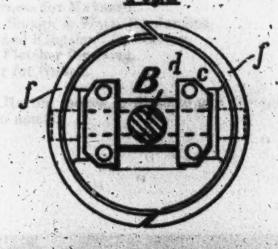


DEFENDANTS EXCHAIT 4.2.
Stellman Butch of Maynerd Pitiest Structure.
(Filed January 27, 1984)



DEFENDANTS EXHIBIT 4-A.
Stellman Statch of Maygard Palent Structure
(Filed January 27, 1984.)





DEFENDANTS' EXHIBIT 4-B.

Photostat of Roots Superimposed on Ebbs.

(Filed January 27, 1934)

DEFENDANTS' EXHIBIT 4-C.

Decision of Law Examiner, dated April 4, 1924 in Interference No. 49,569.

(Filed January 27, 1934.)

Hearing: March 10, 1924.

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IN THE UNITED STATES PATENT OFFICE.

Day vs. Taylor vs. Maynard vs. Jardine vs. Hartog vs. Long vs. Gulick.

Patent Interference No. 49569.

Motion to Dissolve. Motion to Amend.

Pistons.

Application of Ray E. Day filed Jan. 10, 1923, No. 611,-698.

Application of George A. Taylor filed June 17, 1922, No. 569.104.

Application of Howard E. Maynard filed Jan. 3, 1921, No. 434.467.

Application of Frank Jardine filed Mar. 9, 1921, No. 450,-898, renewal of application filed Mar. 11, 1920, No. 364,997.

Application of Stephen D. Hartog filed Feb. 16, 1920, No. 359,137.

Application of Elmer C. Long filed Aug. 13, 1919, No. 317,273.

Application of Edward J. Gulick filed Nov. 30, 1917, No. 204,661.

Mr. Clarence E. Mehlhope for Day.,
Messrs. Macleod, Calver, Copeland & Dike for Taylor.
Mr. J. King Harness for Maynard.
Messrs. Richey, Slough & Watts for Jardine.
Messrs. Rippey and Kingsland for Hartog.
Mr. Herbert G. Fletcher for Long.
Mr. Ray S. Gehr for Gulick.

The party Hartog moves to dissolve and the party Gulick moves to amend.

The issue is defined in a single count which is as follows:

A piston for internal combustion engines comprising in combination a head portion having an endwall and a side wall, a guide portion having on one side a cylinder-engaging part disposed to take the angular thrust of a connecting rod during one stroke of the piston, said cylinder-engaging part being separated at its upper end from said side wall by an air gap and being split longitudinally to accommodate expansion incident to the heating of the piston, a pair of separated pin bosses, and walls integrally uniting said bosses, the guide portion and the head portion.

Hartog's motion denies the right of Gulick and Hartog to make the count. As to Gulick it alleges that in his disclosure there are no walls separate from the head portion "integrally uniting said bosses." The quoted excerpt from the count has an apparent meaning which is different from the necessary meaning dependent upon the context. The complete phrase is "walls integrally uniting said bosses, the guide portion and the head portion" which means nothing less than that the bosses, guide portion and head portion are integrally united by walls. In Gulick's drawings the bosses 16, the guide portion 11, and the head portion 10 are integrally united by walls 17, 18, 20. This structural arrangement satisfies the requirement of the count.

As to Hartog a similar allegation is made to the effect that Hartog's disclosure does not have "walls integrally uniting said bosses," but it is plain in Figs. 1 and 4 of Hartog that walls 12 integrally unite bosses 13, guide portion 11 and head portion 10. It follows that

Hartog's motion must be denied.

The amended motion to amend by Gulick presents

claims 34 to 47 which are as follows:

34. A one piece piston having a solid end portion and skirt portion which is adapted to engage the entire circumferential wall of the cylinder in which it reciprocates, said piston being provided with an annual slot cut entirely through the thickness of its peripheral wall, a pair of wrist pin bearings, connecting means extending from said solid end portion to said bearings, said skirt portion having a slot cut entirely through the thickness of its peripheral wall extending from one end of the pis-

ton to said annular slot, and connecting means extending from each of said bearings to said skirt portion.

- 35. A one piece piston having a solid end portion and a skirt portion which is adapted to engage the entire circumferential wall of the cylinder in which it reciprocates, said skirt portion being provided with an annular slot, a second slot extending from one end of said skirt portion to said annular slot, said slots being cut entirely through the thickness of the peripheral wall of the skirt portion, a pair of wrist pin bearings, and integral means depending from the solid end portion of the piston to said bearings and said skirt portion for the support of said skirt portion.
- 36. A piston comprising a head, a skirt separated therefrom by a continuous transverse slit, a longitudinal slit extending from the latter to the lower edge of the said skirt, and means for connecting the portions of the skirt which bound said longitudinal slit with said head.
- 37. A piston having a head and body parted from each but held integrally connected with each other by internal yielding ribs, a hit cut through the body providing means for expansion and contraction of said body.
- 38. A piston having a head and a guide structure connected thereto and comprising diametrically opposite cylinder-engaging parts, wrist pin bosses between the cylinder-engaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable and arranged not to engage the cylinder.
- 39. A piston as claimed in claim 38 characterized by being integrally cast.
- 40. A piston as claimed in claim 32 characterized by being integrally cast.
- 41. A piston comprising a head, a cylindrical skirt beneath said head, parallel webs extending downwardly from said head and connected to said skirt whereby recesses are provided between the lower ends of said webs and said skirt and between the upper ends of said skirt and said head, one side of said skirt between the points of attachment of said webs thereto being slitted longitudinally, and wrist pin bearings carried by said webs.

- 42. In a piston for an internal combustion engine, the combination of a head provided with ring grooves therein, a pair of webs integral with and dependent from said head and located opposite each other, diametrically oppositely disposed wrist pin bosses, one in each of said webs, a skirt for said piston, integrally connected to each of the side edges of the webs, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston.
- 43. In a piston for an internal combustion engine, the combination of a head and a pair of cordal webs substantially rectangular in shape, located opposite each other in the piston and connected integrally at their upper edges to the piston head, diametrically oppositely disposed wrist pin bosses, one in each of said webs, and a skirt for said piston integrally connected to each of the side edges of the webs, said piston being provided with circumferential slots between the skirt and head and with a longitudinal slot extending from one of the circumferential slots to the open end of the piston.
- 44. In a piston for an internal combustion engine, the combination of a head, webs integrally connected to said head and dependent therefrom, oppositely disposed piston pin bosses mounted one in each of said webs and integral therewith, a skirt for said piston, integrally connected to each of said webs and extending beyond the same, said piston being provided with circumferential slots between the head and skirt and with a longitudinal slot connecting one of said circumferential slots and the open end of the skirt of the piston.
- 45. In a piston for an internal combustion engine, the combination of a head having ring grooves therein, a plurality of cordal webs integrally connected with the piston head and extending downwardly therefrom, oppositely disposed piston pin bosses, integral with said webs and mounted therein, a skirt for said piston longer than said webs and interconnected at the side edges of the webs to each of said webs, said piston being provided with circumferential slots between the head and skirt and with a longitudinal slot connecting one of said circumferential slots with the open end of the skirt.

- 46. In a piston of the class described, a cuplike head comprising a pressure receiving end and a wall portion, a skirt circumferentially disconnected from the wall portion of the head and divided from end to end, and skirt carriers connecting said skirt to the pressure receiving end, said skirt carriers being disconnected from the wall portion of the head and susceptible of being slightly flexed radially.
- 47. A piston comprising a head, a skirt having resilient sections separated from said head by a slit extending continuously around the piston, and means for yieldingly connecting said skirt sections with said head.

Claims 34 and 35 are copies of Long's claims 4 and 7 in his application No. 317,273. They appear to be unpatestable over the patent to Spillman No. 1,092,870 or the French patent to Chenard No. 468,595 of 1914, in view of the patent to Ebbs No. 700,369. The French patent and the Spillman patent show all that is claimed except the longitudinal slot which is found in Ebbs and can accommodate circumferential thermal expansion.

Claim 36 is the same as claim 13 of Long which defines no patentable novelty over the patent to Ebbs No. 700,309. The portions of the skirt which bound the longitudinal slif are not necessarily closely adjacent to the slit, and in Long's disclosure the connecting means 11 is not closely adjacent to slit 7.

Claim 37 is claim 4 of Hartog's application No. 359,137 and is not patentable over the issue in Interference No. 49570, the slit through the body portion being without novelty in view of Ebbs patent No. 700,309. Gulick can make this claim.

Claim 38 is the same as claim 20 of Hartog. Gulick can make it but it is not patentably distinct from the issue in Interference No. 49572.

Claim 39 would not be patentably different from claim 38 since it is common to make pistons of cast metal.

Claim 40 is similar to Hartog's claim 25, and like claim 39, would not be patentably different from claim 38.

Claim 41 is the same as claim 7 of Maynard Ser. No. 434,467. This claim does not distinctly define the invention it purports to cover and is objectionable because the structure recited prior to the "whereby" clause in line 3 is not sufficient to support the function stated in the

"whereby" clause. Merely extending parallel webs downward from the head to the skirt will not form any definitely located "recesses." Claim 42 is the same as claim 7 of Jardine No. 450,898. It can not be made by Gulick since he has not a plurality of ring grooves nor a plurality of circumferential slots. Claim 43 is the same as claim 8 of Jardine. It is not patentably distinct from claim 42. Gulick can not make it because he does not disclose a pair of cordal webs substantially rectangular in shape, and the circumferential slots between the skirt and the head.

Claim 44 is a copy of Jardine's claim 9. Since Gulick has not a plurality of circumferential slots he can not make it. Claim 45 is claim 16 of Jardine. Gulick can not make it for the same reasons that he can not make claim 42. Claim 46 is claim 19 of Jardine which is the issue of Interference No. 49578. It is very doubtful if Gulick's skirt carriers 17, 18, 20 are susceptible of being slightly flexed radially and it is held he can not make this claim. Claim 47 is claim 22 of Jardine which is the issue of Interference No. 49583, Hartog v. Jardine v. Spillman. It is not clear that Gulick can make this claim because his skirt is not divided into a plurality of resilient sections by a plurality of longitudinal slits. He has a single longitudinal slit and the skirt comprises a single integral device whose ends terminate at the edges of the longitudinal slit. In the pistons of Hartog, Jardine and Spillman the skirt is divided-into sections by a plurality of longitudinal slits.

The amended motion to amend is denied for the reasons stated.

Hartog's motion is denied.

A limit of appeal from the decision on Gulick's amended motion is set to expire April 24, 1924.

I. P. DISNEY,

Law Examiner.

April 4, 1924.

DEFENDANTS' EXHIBIT 4-D.

Decision of Law Examiner, dated April 4, 1924, in Interference No. 49,574.

(Filed January 27, 1934.)

Hearing: March 4, 1924.

IN THE UNITED STATES PATENT OFFICE.

DAY V. TAYLOR V. LONG V. MAYNARD V. HARTOG V. GULICK.

PATENT INTERFERENCE No. 49.574.

MOTION TO DISSOLVE:

PISTONS.

Application of Ray E. Day filed January 10, 1923, Ser. No. 611.698.

Application of Geo. A. Taylor filed June 17, 1922, Ser. No. 569,104.

Application of Elmer C. Long filed January 17, 1921, Ser. No. 437,690.

Application of Howard E. Maynard filed January 3, 1921, Ser. No. 434,467.

Application of Stephen D. Hartog filed February 16, 1921, Ser. No. 359,137.

Application of Edward J. Gulick filed November 30, 1917, Ser. No. 204,661.

Mr. Clarence E. Mehlhope for Day.

Messrs. Macleod, Calver, Copeland and Dike for Taylor. Mr. Herbert G. Fletcher for Long. Messrs. Whittemore, Hulbert & Whittemore and Mr. J.

King Harness for Maynard. Messrs. Rippey and Kingsland for Hartog.

Mr. Ray S. Gehr for Gulick.

The parties Hartog and Long move to dissolve on the ground of non-patentability of the issue.

The single count of the issue is as follows:

A piston closed at one end and open at its opposite end, said piston having an annular cutting formed through the thickness of its peripheral wall thereby providing a separated sleeve-like skirt which is approximately cylinder bearing in its entirety, a

pair of wrist pin bearings depended from said piston end and being free from engagement with said skirt, supporting means extending from each of said bearings to said skirt, said skirt being provided with a longitudinal slot cut through the thickness of its wall and extending from the open end thereof to said annular cutting.

The party Hartog relies upon the following patents:

Derby & Kaiser, 1,053,790, Feb. 18, 1913, Spillman & Mooers, 1,092,870, Apr. 4, 1914, Ebbs, 700,309, May 20, 1902.

The party Long relies upon the same patents to .

Spillman and Mooers and Ebbs.

In the Derby patent it is not seen that the piston has an annular cutting formed through the thickness of its peripheral wall thereby providing a separated sleeve-like skirt, and the longitudinal slot mentioned in lines 8 and 9 of the count does not extend in the Derby patent to "said annular cutting."

The patent to Spillman would anticipate the count if there is no inventive effort in forming the longitudinal slot in the skirt. The primary examiner has so held and the longitudinal slot is found in the patents to Ebbs or

Derby.

The application of the Spillman patent to the count, except for the longitudinal slot, seems to be clear and requires no discussion. The count does not distinctly include any specific elements or relation of elements from which any functions not possible in the patents cited would flow and its scope may not be restricted beyond the fair and ordinary meaning of its terms.

The patent to Ebbs discloses all the elements of the count except a pair of wrist pin bearings depended from the piston end and free from engagement with the skirt.

It seems to be immaterial from a patentable standpoint whether the cross head has one relatively long bearing or two short bearings for the connecting rod wrist pins, and the cross head bearing is free from engagement with the parts of the skirt opposite to the ends of the bearing. The patent to Ebbs alone is a substantial anticipation of the count.

The motions are granted.

A limit of appeal is set to expire April 24, 1924.

I. P. DISNEY,

Law Examiner.

DEFENDANTS' EXHIBIT 4-E.

Decision of Law Examiner, dated April 4, 1924, in Interference No. 49,580.

(Filed January 27, 1934.)

Hearing: March 5, 1924.

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IN THE UNITED STATES PATENT OFFICE.

TAYLOR VS. LONG VS. HARTOG VS. GULICK.

PATENT INTERFERENCE' No. 49580.

MOTION TO DISSOLVE.

PISTONS.

Application of George A. Taylor filed June 17, 1922, Ser. No. 569,104.

Application of Elmer C. Long filed Dec. 17, 1921, Ser. No. 522.974.

Application of Stephen D. Hartog filed Feb. 16, 1920, Ser. No. 359,137.

Application of Edward J. Gulick filed Nov. 30, 1917, Ser. No. 204,661.

Messrs. Macleod, Calver, Copeland & Dike for Taylor.
Mr. Herbert G. Fletcher for Long.
Messrs. Rippey and Kingsland for Hartog.
Mr. Bay S. Gehr for Gulick.

The parties Long and Hartog move to dissolve on the ground that the issue is unpatentable in view of the patent to Spillman and Mooers, No. 1,092,870, April 4, 1914.

The single count of the issue is as follows:

A piston comprising a head, a skirt separated at its periphery from the head, and pin bosses, integrally connected to the head and to the upper and lower part of the skirt, the outer ends of the pin bosses being spaced from the opposing parts of the skirt wall and said skirt having openings opposite the open ends of the bosses.

The patent clearly satisfies all the requirements of the count except the limitation that the pin bosses are to be integrally connected to the upper part of the skirt.

The pin bosses in the patent are obviously integrally connected to the head and to the lower part of the skirt, the latter connection at a point remote from the head, being designed by the patentee to avoid as much as possible the transmission of heat from the hot piston head to the skirt. The count gives no indication of any definite reason for connecting the pin bosses to the upper part of the skirt but the natural and obvious reason would be to reinforce or strengthen the connection between the pin bosses and the skirt. This is accomplished in Gulick's piston by elongating the attachment of the rib to the skirt at points adjacent to the skirt but any form of '. integral connection from the piston boss to the per part of the skirt as well-as to the lower part would be covered by the count. The point for decision is therefore reduced to the simple proposition: Is it patentable to connect the pin boss to the upper part of the skirt for any ordinary purpose, such as to reinforce the support of the skirt? If it should be found that the support of the skirt by connection to its lower part is insufficient, it seems clear that no more than common mechanical skillwould be required to correct the defect and supply the remedy by additional connections or braces between the upper part of the skirt and the pin boss. It is true the advantage sought by the patentee would be lost in part but an adequate support for the skirt would be just as necessary as the avoidance of undue heating and the loss in one respect would be offset by the gain in the other, The idea of reinforcing or strengthening weak parts has been repeatedly recognized as requiring no inventive effort. Turner v. Lauter, 248 Fed., 931, 933. Walker Mfg. Co. v. Illinois Brass Mfg. Co., 265 Fed., 279.

The motion is granted.

A limit of appeal is set to expire April 24, 1924.

I. P. DISNEY,

Apr. 4, 1924.

Law Examiner.

DEFENDANTS' EXHIBIT 4-F.

Decision of Law Examiner, dated April 7, 1925, in Interference No. 49,575.

(Filed January 27, 1934.)

Hearing: March 20, 1925.

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IN THE UNITED STATES PATENT OFFICE.

LONG VS. GULICK.

PATENT INTERFERENCE No. 49,575.

APPEAL FROM THE EXAMINERS-IN-CHIEF.

PISTONS.

Application of Elmer C. Long filed December 17, 1921, Ser. No. 522,974.

Application of Edward J. Gulick filed November 30, 1917, Ser. No. 204,661.

Mr. Herbert C. Fletcher for Long. Mr. Ray S. Gehr for Gulick.

The party Long has appealed from the decision of the examiners-in-chief, affirming that of the examiner of interferences, awarding priority to the senior party, Gulick, for invention of the subject matter as defined in the following count:

A piston having a head portion with a ring groove therein, a skirt portion having its cylinder-engaging part separated from the head portion, separated pin bosses having integral flanges connecting them with the skirt on both sides of the bosses and with the head portion respectively, said skirt being split from top to bottom on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

A motion to dissolve was presented by Long to the law examiner on the ground that Gulick had no right to make the claim by reason of lack of disclosure. This motion was denied by the law examiner and judgments of priority by the tribunals below followed.

No testimony having been taken and Long being the junior party, the only question here to be reviewed is that of Gulick's right to make the claim involved in the issue.

The construction relates to a piston for a motor, preferably of the internal combustion type, in which there is a head and a separate skirt portion, the latter connected with the pin bosses on both sides by flanges. The skirt portion is split from top to bottom on one side and by virtue of such an arrangement free expansion and contraction of the skirt portion is obtained. Both parties have constructions which fall within the terms of the count but the party Long contends that the construction of Gulick is not such as to "permit free expansion and contraction of the skirt portion." The flanges of Long are set at an angle with respect to the pin bosses and for this reason Long contends that the skirt portion is free to expand and contract. The Gulick flanges are extended at right angles to the axis of the pin bosses and Gulick states that this results in a rigid construction between the

pin bosses and the guide portion of the piston.

In the operation of a piston of this character in a gas engine there are wide changes in temperature with resulting expansion or contraction of the metal of the parts. The cylinder wall elongates in a line at right angles to the movement of the cylinder and this elongation, in the construction of both parties, is provided for by the slot in the skirt of each piston. The party Long contends that with his construction, the flanges move about their points of attachment to the bosses as centers and in that manner pull the expanding cylinder wall inward and prevent the binding or freezing of the piston in the cylinder. Since Gulick has stated that the connections between the bosses and the cylinder skirt are "extremely rigid," Long contends that such action as takes place in his construction is impossible with that of Gulick. Long further contends that this rigid connection would result, with Gulick's piston, in use, in the piston wall loosing its round shape and binding in or scoring the cylinder. An explanation is submitted by Long as to the result of an expansion of the cylinder walf of Gulick and the con-clusion was pressed at the hearing that the skirt would tend to increase the piston diameter rather than decrease it at such time.

It is not believed that the result, stated by Long to follow the use of his piston, differs from that obtained in

the use of Gulick's piston. The material of which both types of pistons are made will readily yield to the small extent required to bring the piston skirt to the proper diameter and such yielding is so small as to be within the stress or elasticity limits of the material. It is believed substantially the same action takes place with the constructions of both parties and that in each instance the skirt will move the small distance permitted by the slot to accommodate itself to the pressure and stress conditions brought about by the temperature changes. It is doubted if, in either construction, the flanges move as indicated in Long's Figure 5, as if they were pivoted to the pin bosses. There would be some yielding throughout the length of the flanges unless these were made especially thin where they join the bosses. Likewise, in Gulick's construction, and it must be remembered the motion is extremely slight and measured in thousands of an inch, there would be stresses and vielding throughout the lengths of the flanges. It would seem clear enough the operation is substantially the same in the Gulick as in the Long construction. The expression "free expansion and contraction" must be interpreted in view of the disclosure of Long as well as that of Gulick. The count did not originate with Long. The term "free" must mean a movement which must overcome the resistance of the flanges to flexure in the construction of Long and when this is done, a similar interpretation makes the terms applicable to the construction It is believed plain the latter is entitled to of Gulick. make the count of the issue.

The party Long has urged that the count of the issue is unpatentable over the prior art upon which the count in interference No. 49,574, involving the same parties, was held unpatentable by the law examiner. No motion to dissolve as to the instant count was made and. except in a very clear case, the matter should not be considered at this time. It is noted, however, that while the count of the instant interference appears quite similar to that which constituted the issue of interference No. 49,-574, yet the present count has two limitations not found in that of the dissolved interference. The first of these is that the flanges connect the pin bosses with the skirt on both sides of the bosses. The second restriction is that the single split is on one side only of the pin bosses to permit free expansion and contraction of the skirt portion.

The Spillman and Mooers patent, which was regarded as capable of modification in accordance with the Ebbs patent in order to anticipate the count of interference No. 49,574, does not disclose flanges connecting with the skirt on both sides, but the connecting member is in the form of an oppositely apertured cylindrical portion having a flared, more or less disk shaped bottom, which is connected to the skirt below the bosses. The functional limitation at the end of the count implies a yielding in the connecting flanges, as otherwise a skirt with a single slit would not be freely expansible and contractible. The disk shaped connector of Spillman and Mooers would have a stiffening or trussing effect on the skirt so that even if slotted as suggested in the count, the skirt would be substantially unyielding. It is believed the present count is patentable and that in so holding there is no inconsistency with the law examiner's decision in interference No. 49,574.

The decision of the examiners-in-chief awarding

priority to the senior party Gulick is affirmed.

WM. A. KINNAN,

First Assistant Commissioner.

Apr. 7, 1925.

DEFENDANTS' EXHIBIT 4-G.

1 362, 363 and 384 of "Automotive In for January 20, 1930.

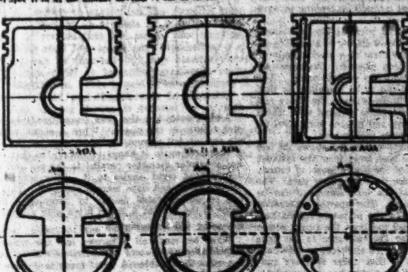
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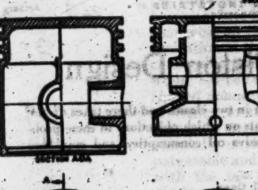
'Filed January 27, 1984)

Aluminum Piston Design

e discussion divides the problem in two classes and there takes up the sile of each class. The four points on which objections to these prob-s are based—went, slaps, excessive oil consumption and crankenso stion—are treated separately.

By E. G. Quan









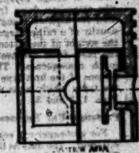










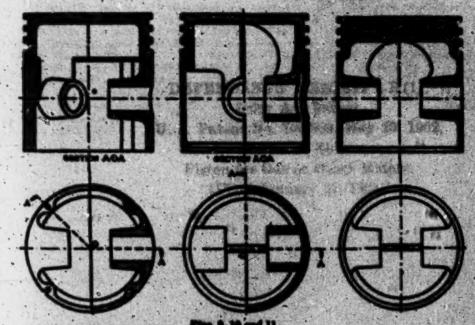






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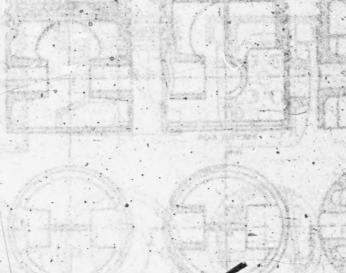
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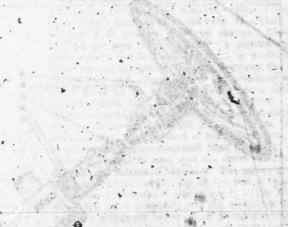
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DEPENDANTS' EXHIBIT 4-H(1).

Prior Art Patent.

U. S. Patent No. 700,309, May 20, 1902,

To H. E. Ebbs.

Piston for Gas or Other Motors.

(Filed January 27, 1934.)

Me. 700,309.

Patented May 20, 1902.

SPISTON FOR GAS OR OTHER MOTORS.

(He-Medel.)

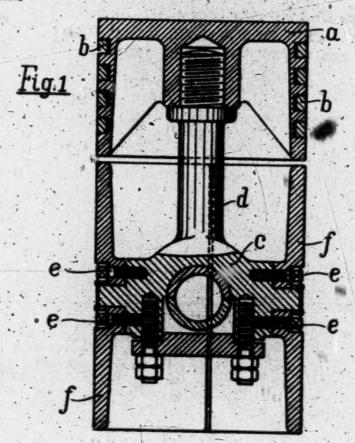
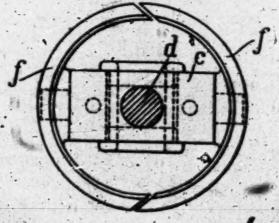


Fig.2



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Shaming Siles

United States Patent Office.

HERMANN EDGAR RBBS, OF NUREMBERG, GERMANY, ASSIGNOR TO THE FIRM OF VERBINIGTE MASCHINENFABRIK AUGSBURG UND MASCHINenbaugeselischaft nürnberg A.-G., of nurenberg, germany.

PISTON FOR GAS OR OTHER MOTORS.

SPECIFICATION forming part of Letters Patent No. 700,309, dated May 90, 1909. Application Stol December 18, 1888. Social No. 746,895. (No model.)

To all whom it may concern:

Be it known that I, HERMANN EDGAR ERRS, a subject of the Queen of Great Britain, residing at Nuremberg, Bavaria, German Empire, have invented certain new and useful improvements in Pistons for Gas or other Motors, of which the following is a full, clear, and exact description.

The present invention relates to pistons for many and other motors; and is consists of the details of construction hereinafter set forth, and particularly pointed out in the delime.

In order to render the present specification easily intelligible, reference is half to the accompanying drawings, in which similar letters of reference denote similar parts throughout both views.

Figure 1 is a longitudinal section throughout

Figure 1 is a longitudinal section through the center of the picton, and Fig. 2 a front so elevation of the same.

In pictons for gas and petroleum motors the front part of the wiston.

In pistons for gas and petrol the front part of the piston only

part of the platon which serves to guide the same in the cylinder is made entirely separate from the rear portion which serves to carry the packing-rings and to close gas-tight against the walls of the cylinder.

According to the present invention the platon proper, a. is provided with the packing-

AS STICIL

DEFENDANTS' EXHIBIT 4-H(2).

Prior Art Patent.

U. S. Patent No. 908,500, Jan. 5, 1909, To F. D. Howe.

Engine.

(Filed January 27, 1934.)

P. D. HOWE.

908,569. Patented Jan. 5, 1909. Fig. 3. Fig. 2.

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UNITED STATES PATENT OFFICE.

PRANK D. HOWR, OF PORT WASHINGTON, NEW YORK.

Be it known that I. Phant D. He citizen of the United States, reading to Washington, country of Resear, and a New York, have mystiled outself the useful improvements of freeze, of the following is a specification, retaining had to the accompanying drafticities a part seems.

It is described united to a minimum amount of histograms of which commonly of histograms of which country works by the piece into the country chamber. It was been and which country of histograms of which country chamber. It was because it which country of his pieces into the country of the search of the proof of the search of the proof of the search of

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back through the interior of the piston into the oil beneath.

It is obvious that the improvements may be embodied in other ways than those shown, a described or referred to berein.

I claim as my invention:

1. In an engine, the combination with the engine cylinder, of a piston therein, a piston ring pressing against the walls of the cylinger, a recess to receive oil from the inner surface of the cylinder, and a relief for the re-

2. In an engine, the combination of a working chamber, a piston therein having a peripheral recess, and a ring in the recess pressing against the walls of the chamber, said piston having a second recess arranged next to the ring so as to receive the oil suraped by the ring from the walls of the second chamber.

8. In an engine, the combination of a working chamber, a piston therein having a peripheral recess, a ring in the recess pressing against the walls of the chamber, said piston as having a second recess adjacent to the ring, and a relief for said second recess.

and a relief for said second recess.

4. In an engine, the combination of a working chamber, a pistor therein having a peripheral recess, a ring in the recess having se a sharp edge toward the forward end of the piston, said piston having a second recess adjacent to the ring, and a relief for said second recess into the interior of the piston.

5. In an engine, the combination of a working chamber, a hollow piston therein having a peripheral recess, and a ring in the recess having a sharp edge toward the forward end of the piston, said piston having a second recess extending around its periphery

just ahead of the ring, and channels connecting said recess with the hollow of the piston 6. In an engine, the combination with the engine cylinder, of a piston therein, a pistor ring pressing against the walls of the cylinder, a recess next to the ring to receive of from the inner surface of the cylinder, and relief for the recess.

7. In an engine, the combination with the engine cylinder, of a piston therein, and sharp edge extending around the peripher of the piston adapted to remove the oil from the inner surface of the cylinder as the piston moves in a direction away from the cylinder or out of the cylinder.

8. In a vertical engine, the combination with the cylinder, of a piston working there in, and provided with means for removin oil from the inner surface of the cylinder at the piston moves downwardly and discharge

the piston moves downwardly and disch ing is from a point removed from said

9. In an engine, the combination with the engine cylinder, of a piston therein having wrist-pin, a piston ring pressing against the walls of the cylinder, a recess to receive of from the inner surface of the cylinder, as a relief for the recess around the wrist-pin.

10. In an engine, the combination with the engine cylinder, of a piston therein, piston ring, a recess into which the ring adapted to scrape oil, and a relief for the recess.

This specification signed and witner this 20th day of June, A. D., 1906. FRANK D. HOWI

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which by nieuranal deligner. The second of the second

Signed in the presence of-House H. Snow, PRANCES E. VARIET. DEFENDANTS' EXHIBIT 4-H(3).

Prior Art Patent.

U. S. Patent No. 1,031,212, July 2, 1912,

To E. Van Bever.

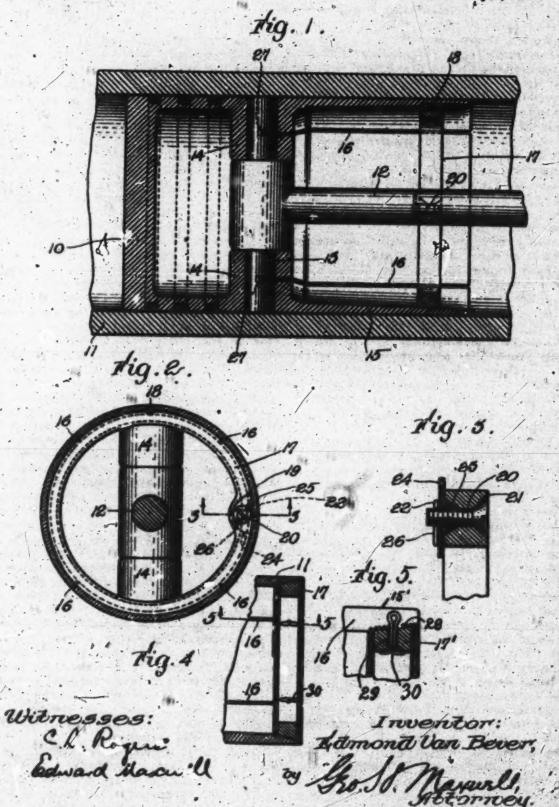
Expansible Piston.

(Filed January 27, 1934.)

E. VAN BEVER.
EXPANSIBLE PISTON.
APPLICATION FILED SEPT. 18, 101

1,031,212.

Patented July 2, 1912.



UNITED STATES PATENT OFFICE 1681

EDMOND VAN HEVER, OF WATERTOWN, MARRACHURETTS.

MERABURAL PUROS.

1,031,212,

Specification of Letters Patent.

Patented July 8, 1912.

Application filed September 18, 1912. Sectal No. 000,000.

To all whom it may concern:

Be it known that I, Edward Van Buvan, a citizen of the United States, and resident of Watertown, county of Middlesex, Components in Expansible Pistons, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings to representing like parts.

This invention relates to pistons and while applicable to other and more general uses, is especially designed for use in gas engine construction.

It As is well known, the ordinary engine piston or plunger, though it may have been originally formed to closely fit its cylinder, after a period of new wears down to a certain extent and this, along with the wear of the cylinder, makes the piston sploons fit in the cylinder, makes the piston sploons fit in the cylinder so that it tends to have some small lateral chucking play therein, which is only imperfectly prevented by the packings. This locamens of the puton in its cylinder tends to the fitting of these.

The present construction provides a piston formed so as to be expansible from

opecial attention to the fitting of the The present construction provides ton formed so as to be expansible in its diameter due to wear, so that after a considerable period of us, it the beginning.

the beginning. The invention n will be I from the follo

86 19 by write pin 18 1 14 projecting inwest

intermediate of its length. The hollow shall of the piston, as is must, extends rearwardly for some distance from the wrist pin connection as soon at 14, this rearwardly extending portion being alliphtly tapered so as to terminate in a relatively thin inner extraority. In the practice of my invention this hollow shall, for a considerable distance from its inner end, a divided into a number of sections, above as four, by lengthwise shifts 16. These slits, which, in the illustrative embodiment shown, extend substantially to the wrist pin connection though the exact length thereof is not made torial, may be readily formed by sawing the piston shell with an ordinary metal new. These sectional portions have a certain amount of springing capacity which need only be very slight for the present purpose, and as a means for expanding them outward to the small extent accessary. I provide an expanding ring 17 fitted into the piston above and held from casual displacement by means shown as a serve bolt 18 at apped in a hole partly in the ring and partly in the piston shell. The ring 17 is divided at the point 19 and the shutting cache at this point are adapted to be found apartly a curvey bolt 20 fitted to a hole formed in the shutting onds, this holt having a conical head 21 and having afted thereto a service by a curvey bolt 20 fitted to a hole formed in the shutting onds, this holt having a conical head 21 and having afted thereto a service by a curvey bolt 20 fitted to a hole formed in the shutting onds, this holt having a conical head 21 and having afted thereto a service. The hollow

ing device of Fig. 4 and Fig. 5 may be advantageously employed. As shown in these figures, the inner end 15' of the piston, which is provided with slots 16 as before which is provided with slots 16 as before 6 described, has an internal tapared thread formed therein as seen at 28, and engaging with this thread is a ring 17 having a correspondingly tapered and threaded outer poriphery. This ring may be screwed into the piston end to expand the sectional portions thereof to the extent desired, and as a suitable means for preventing the working out of this ring, I provide radial holes 29 therethrough at intervals through one or 15 more of which a cotter pin 30 is passed so that its head extends up into a slot 16 without reaching the periphery of the piston. out reaching the periphery of the piston, while its inwardly projecting ends may be bent over the ring to prevent dislodgment.

Thus the head of the cotter pin engaging with the walls of the slot 16 effective vents any turning of the ring and holds the parts in precise adjusted position. The resiliency effected by the slits 16 may be 25 somewhat enhanced if desired by the drilling of holes 27 in the extremities of these

26 somewhat enhanced if desired by ing of holes 27 in the extremities of these slife, though this is not essential to the effective carrying out of the invention.

It will be understood that while a cast iron piston of usual form is shown for illustrative purposes in setting forth the principles of my invention, the invention is not limited to this one form of piston, but may different piston ples of my invention, the invention is no limited to this one form of piston, but me be carried out with various different pisto and plunger constructions. The invention is likewise adapted for use in the production of new pistons or for the refitting of obtaind worm plungers. In the case of a plunger worn by use, all that is necessary is to remove it, new the slits 16 from its innered, select an expanding ring of proper six and fit it to this fixed by the usual tapering g of old and fit it to the maid of the shell, this it-ting being facilitated by the usual tapering form of the standard types of hollies shell 45 ploton from the wrist pin inward. Having described my invention, what I claim as new and desire to pure by Letters

Patent is

1. A pinton formed with a hollow shall tegral with the main body thereof, there integral with the main body thereof, to being slits lengthwise through the from its inner end, and means for expering the sectional portions thus formed take up for wear.

2. A piston formed with a hollow shell atogral with the main body thereof, there sing a plurality of equily speed apart

lengthwise slits through the inner end portion of the shell, and an internal extender
for the sectional shell portions thus formed.

A piston, having an inwardly extending shell portion integral therewith with a
plurality of equally spaced apart lengthwise extending slits therethrough, and an
internal expander for springing out and
holding in expanded adjustment the sectional shell portions thus formed.

A piston, having a wrist pin fitted to
inwardly projecting bosses thereof, and a
shell portion extending inwardly from said
wrist pin integral with the body of the piston, said shell portions being sectioned by a
plurality of equally spaced apart slits into
segmental portions, and an internal expanding ring fitted to the interior of said sectional shell portions.

5. A hollow shell piston, having inwardly

tional shell portions.

5. A hollow shell piston, having inwardly extending bosses with a wrist pist fitted therein, and a shell portion integral with the piston body cutanding inwardly from said wrist pin, said integral shell portion having a lengthwise extending slit therethrough, and an internal expander fitted to expand said inwardly extending shell portion.

6. A piston, comprising an integral is with a slot extend ough for a part of gth; and s e expanding said a s up for portion to tal

7. An int

MOND VAN BEVER

LD EDWARD MAYO DEPENDANTS' EXHIBIT 4-H(4).

Prior Art Patent.

U. S. Patent No. 1,092,870, April 14, 1914,

To E. O. Spillman & L. P. Mooers.

Piston for Explosion Engines for Motors.

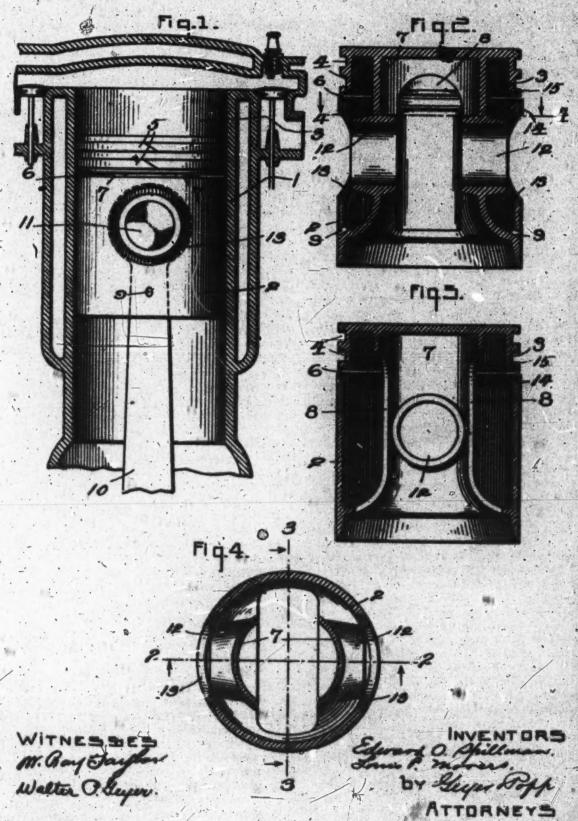
(Filed January 27, 1934.)

1684

E. O. SPILLMAN & L. P. MODERS. PISTON FOR EXPLOSION ENGINES OR HOTORS. APPLICATION FILED JULY 10, 1912.

1,092,870.

Patented Apr. 14, 1914



UNIVERD STATUES PATERTY OFFICER

EDWARD O. SPILLMAN AND LOUIS P. MOORES, OF HOREST TOWNWANDS, MEN TORK

PRINCE FOR EXPLOSION MIGHTER OF MOTORS.

1,092,870.

Specification of Lotters Palant Patented Apr. 14, 1914. Seating that July 10, 1913 Bortal So. 779,287.

To all schom it may concern:

Be it known that we Enwam O. Spinshan and Louis P. Moome, citizens of the United States, residing at North Tonnswands, in the county of Niagara and State of New York, have invented new and meful Improvements in Pistons for Explosion Engines or Motors, of which the following is a specification.

a specification.

This invention relates more particularly to the pistons of explosion engines or mo-

to the pistons of explosion engines or motors.

As ordinarily constructed, the head and the body of the piston are integral or continuous, and the head, which is subjected to the full heat of the gas, transmits the same to the budy. The resulting expansion of the body causes the same to bud budy. The resulting expansion of the body causes the same to be budy inder, sooring or greeving the latter in time, or if the piston-body is sited loosely enough to avoid storing, it ruttles in the cylinder and fails to compress the explosive mixture to the proper degree, impairing the all-ciency of the motor.

It is the object of our invention to so construct the paston that the conduction or transmission of heat from the head to the body or guide portion of the piston is reduced to a minimum. Expansion of the obody is thus diminished precisely to that of the dylinder and the body may be closely fitted therein, thereby obtaining the maximum efficiency of the motor, availing rattling of the piston, and at the using time ting of the piston, and at the using time is preventing seeing of the cylinder.

In the accompanying drawings: Figure 1 is a sectional deviation of a motor provided with the improved piston. Fig. 2 and 3 are longitudinal sections of the piston on the 40 correspondingly sumbered lines in Fig. 4. the packing rings being emitted. Fig. 4.

Similar characters of reference indicate.

Fig. 9. Similar characters of reference corresponding parts throughout the

1 indicates a motor crimise of any ordinary construction, the criticise forming no part of our invention.

2 indicates the body or guide-parties of the piston, and 3 the bend or front parties thereof which is shown as having the materiary ameniar grooves if for receiving the usual packing rings.

The wall of the heat, instead of laine integral or continuous with the wall of the

body, is isolated or separated from it by a gap or space 6 of suitable width to avoid or minimize transmission of the heat from said head-section to said body or guide-section as and thereby prevent objectionable expension of the latter. This gap may be produced by a new out made after machining and before grinding the piston.

The head and guide sections of the transversely-divided piston are tied together by any suitable connection, that shown in the drawings committing of a tubular longitudinal web? arranged within the hollow sections and cast in one piece therewith.

In the construction illustrated in the drawings, the web is separated from the surrounding walls of the head and guide sections by a comparatively wide space, and the topper and of this connecting web joins as the head of the head section, while its lower and joins the guide-section hear its

or skirt from the wall of the head-section, which prevents undue expansion of the guide-section, as hereinbefore described. The body-section is long or extensive relative to the head-section and acts as a guide or cross-head therefor which receives all the side thrust of the connecting red and keeps the head-section out of contact with the cylinder-wall at all times, causing it to operate freely and pointlessly. 10 operate freely and noiseless!

As shown, the guide section is extended forwardly or upwardly beyond the wrist-p and in practice preferably terminates about a sixteenth of an inch short of the inner end 15 of the head-section to leave the isolating

gap 6.
This improved construction combines the important advantages of maximum engine efficiency, smooth and noiseless action of the 20 piston and non-scoring of the cylinder; and these are obtained by simple means which do not materially increase the cost of the piston.

Preferably the upper edge of the piston body is beveled or inclined toward the axis of the piston, as shown at 14, while the lower edge of the piston-head is beveled in the reverse direction, as shown at 15. By this construction, on the upward stroke of the piston the lower beveled edge 14 defects or 30 crowds the surplus oil back into the piston, while on its downward stroke, the upper beveled edge 15 performs the same function.

We claim as our invention:

1. A piston comprising a head-section, a

35 guide-section having its peripheral wall isolated from the corresponding wall of the
head-section by a non-conducting gap extending practically around the piston, the
guide-section being relatively long to form

40 a cross head, and means connecting said sec-

tions.

2. A piston comprising a head-section, a guide-section forming a cross head and having its wall isolated from the wall of th

46 head section by a regrow non-conducting gap, and means connecting said sections.

3. A piston comprising a head-section, separate guide-section than for, means connecting said sections, and a wrist-pin hear ing, the wall of the galle-section extending forwardly beyond the wrist-pin hearing an terminating short of said had-section to leave a non-conducting map between said sections. tions.

4. A piston comprising a head-section, a guide-section having its wall isolated from the wall of the head-section by a narrow nonconducting gap, and a web arranged length-

wise within said guide and head-sections and connecting the same, said web being lo-cated at a distance from the walls of said sec-

5. A piston comprising a head-section, a relatively long guide-section having its wall isolated from the wall of the head-section by a non-conducting gap, and an internal web connecting said sections and joining the guide-section at a point remote from said

6. A piston comprising a head-section, a 70 ruide-section isolated from the he by a non-conducting gap, said guide-section being provided in opposite sides with openings, an internal web connecting said head-section with the guide-section, and wrist-pin 75 bearings mounted on said web in line with said openings and isolated from the wall of the guide-section and the edges of said open-

the guide-section and the edges of said openings.

1. A piston comprising a guide section, a shead section isolated from the guide section by a non-conducting gap, and a tubular web arranged within said sections and connecting the same, the web being provided with one or more oil openings.

2. A piston comprising a guide-section, a head-section isolated from the guide-section by a non-conducting gap and an internal tubular web connecting said sections and separated from the surrounding piston-wall, said wall being provided with oil holes.

2. A piston comprising a guide-section, a head-section separated therefore by a gap, and means within the piston connecting said sections, that end of the guide-section forming the rear edge of said gap being provided with an oil deflecting face.

10. A piston comprising a guide-section, a head-section separated therefrom by a gap, and means within the piston connecting said sections, that end of the guide-section forming the rear edge of said gap being bevoled to stope toward the axis of the piston.

11. A piston comprising a guide-section, a head-section separated therefrom by a gap, and means within the piston connecting said to stope toward the axis of the piston.

11. A piston comprising a guide-section, a head-section separated therefrom by a gap.

11. A piston comprising a guide-action, a head-section separated therefrom by a gap-and means within the piston connecting said sections, the adjacent ends of the said sections being bevoled inwardly in opposite di-

s our hands this 11th day of July, 11

1913.

EDWARD O. SPILLMAN. LOUIS P. MOOERS.

C. F. Garan, E. M. GRAHAM. DEFENDANTS' EXHIBIT 4-H(5).
Prior Art Patent.
U. S. Patent No. 1,183,902, Sept. 21, 1915,
To G. E. Franquist.
Piston.
(Filed January 27, 1934.)

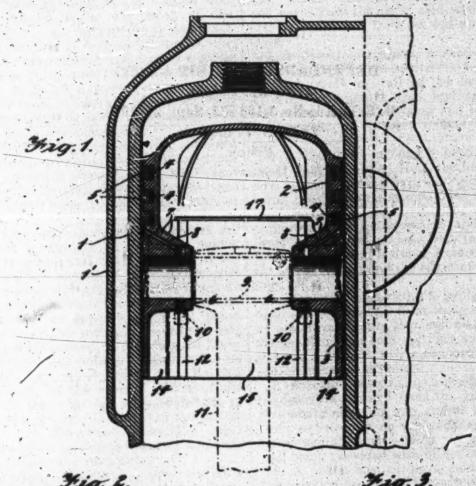
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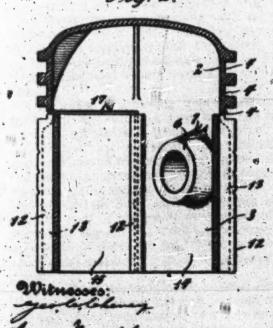
1688 1,153,902. G. E. FRANQUIST.

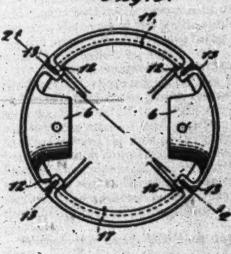
PISTON.

APPLICATION FILED AUG. 1, 1914

Patented Sept. 21, 1915.







Austra & Franzoit

Rosentam Strationis atting

UNITED STATES PATENT OFFICE

GUETAVE E PRANQUIST, OF NEW BRUNSWICK, NEW JERSEY,

PERTON.

1.153,902.

ipodification of Letters Patent. Patented Sept. 21, 1915.

Application filed August 1, 1914. Serial No. 854,484.

To all schom it may concern:

Be it known that I, Gustave E. Franquist, a citizen of the United States, residing at New Brunswick, in the county of
Middlesex and State of New Jersey, have invented certain new and useful Improvements in Pistons, of which the following is a full, clear, and exact description.

This invention relates to internal combus-

in Pistons, of which the following is a full, clear, and exact description.

This invention relates to internal combustion engines and has for its primary object the provision of a piston which will climinate the piston clatter at all speeds and temperatures of the motor.

With this object in view, the invention is circumferentially compressible and is adapted to have a enug slicing fit in the cylinder when cold, so that upon an expansion of the piston it above will automatically yield sufficient? In prevent the piston from sticking in the cylinder, and after the cylinder has also expansion will again automatically resume substantially its normal size and take up the free play between the cylinder and its piston, which would otherwise occur.

The invention also consists of the constructions which will be boreafter described in detail and particularly pointed out in the appended claims.

In the accompanying drawings Figure 1 shows a cantral longitudinal section through a cylinder and a piston constructed in so-cordance with the principles of this invention; Fig. 2; and Fig. 3 is a bottom plan.

Referring to the drawing, I designate broadly the cylinder and I has piston constructed in Fig. 3; and Fig. 3 is a bottom plan.

Referring to the drawing, I designate broadly the cylinder and I has piston shown may be regarded as compressing two parts of the piston in growing the particular construction of which forms no part of the piston in previded with circumferential grooves 4 in which the remaining position of the piston constitutes the slaves. The head of the piston constitutes the slaves. The head of the piston pin tenses 4. These bones are provided with ribs 7 through which as oil groove or hale 5 is hored in order to supplies a pint of the piston constitutes the slaves.

vided in these bosses, and is held in place therein by set screws 10. The pin 9 carries a connecting rod 11, the construction thus far described being typical of the ordinary so hollow "trunk" piston.

As is the usual practice, the circumferen-tial surface of the head of the piston, or that portion which lies between the piston rings, is machined so as to fit very loosely exwithin the cylinder to permit an expansion of the piston, when heated, and is usually from .010 to .090 of an inch less in diameter within the cylinder to permit an expansion of the piston, when heated, and is usually from 010 to 000 of an inch test in diameter than the diameter of the cylinder. The piston rings are also fitted in the grooves to 70 allow them to have some lateral movement. The head of the piston from ratting within the dylinder. It is necessary than to depend upon the shows of the piston in prevent the 75 rettling or elapping of the piston within the cylinder and heretofore it has been customary to allow 000 to 000 free play between the sleeve of the piston and the oylinder to take care of the expansion of the piston bestor the cylinder walls become heated and to prevent the piston from sticking. After the engine has been running for a comparatively long period the cylinder walls expand, who the water in the jacket because heated 30 and the mans necessity for compensating for the expansion of the piston will ust up a rattling and clapping in the cylinder while it we make the water in the jacket because heated 30 and the mans necessity for compensating for the expansion of the piston does not arise. When the deleve the as locally as this within the cylinder, the piston will ust up a rattling and clapping in the cylinder while it we compensation on the piston does not arise, when the sleeve the as locally as this within the cylinder, the piston will ust up a rattling and clapping in the cylinder while it were compensation engine is used on un another than a pasting up, and against after the cylinder has expansion of the piston for a men of the piston. One embediment of each a construction is shown in the drawings and will anow he discribed. Projecting inwardly from the later which probably extend the united length of the sisters of the piston to a point or a level with the middle of the rearreset piston ring. Longitudinal cold the piston to a point or a level with the middle of the rearreset piston ring. Longitudinal cold the piston for the sistend into their rins, form0,

ing the longitudinal grooves in the same. These slots divide the sleeve of the piston into longitudinal sections 14-14 and 15-15, the sections 14-14 carrying the piston pin

Circumferential alots 17-17 are cut in the outer surface of the sleeve in the sections 15-15 respectively, which slots extend to and join the longitudinal slots of 15, separating the longitudinal sections 15 from the head of the piston. The sections 14—14 which carry the piston pin bosses remain integrally connected to the piston head 2 and are relieved from a point on a level with the rearmost piston ring to a point below the piston pin bosses, approximately .005 of an inch on the side, to insure that upon the expansion of the piston the portion of the sleeve which carries the bosses will be prevented from sticking to the cylinder walls and causing either the motor to stop, or the breakage of the parts. In machining a piston of this character, the sleeve is given a relatively sing sliding fit within the cylinder even when cold; or in other words, the piston may be so accurately fitted to the cylinder. 15 the rearmost piston ring to a point below piston may be so accurately fitted to the cylpiston may be so accurately litted to the cylinder that even when the piston is cold and
the motor is starting there will be no rattling or undesirable noises produced by the
se actuation of the piston as the motor picks
up and the temperature of the piston rises,
Due to high temperature of the explosive
gases the piston will commence to expand
and the cylinder walls will therefore exert.

35 a pressure on the same which want he resure on the same which must be relieved in order to prevent the piston from sticking. It is obvious, however, that as the piston expands the longitudinal sections 15—15 which are separated from the head of the piston and the other portions of the sleeve, by the slots 13 and 17, will move inwardly under the pressure which is exerted on these sections by the cylinder walls until the slots 13 and 17 are closed. Howerted on these sections by the cylinder walls until the slots 18 and 17 are closed. However, these slots are made sufficiently large to insure that this will not occur. The rear ends of the sections 14—14 will yield similarly to sections 16—15. It is obvious, then, that the only portions of the sleeve which cannot yield due to the pressure exerted by the cylinder walls on the expanding piston, ere those portions of the sleeve opposite the piston pin bosses, and, as has already been stated, these portions of the sleeve are re56 lieved .005 of an inch or more on the side so that there will be no liability of these lieved .005 of an inch or more on the side so that there will be no liability of these portions of the sleeve sticking to the cylinder walls. The circumference of the piston will therefore be decreased the desired degree and the piston will operate within the cylinder without sticking, while maintaining a snug sliding fit therein which will prevent any rettling. After the motor has been running a comparatively long period of time the water in the jacket becomes

heated and the cylinder expands, but any free play which would otherwise occur will be taken up by the sections of the sleeve which have been compressed resuming their normal position. Another advantage of a 70 sleeve of this character is that in a multicylinder engine it is customary to connect one or more of the cylinders together, which, when the cylinders expand, will cause a distortion of the cylinders from a true circle 73 in cross section. By making the sleeve compressible in the manner described, any distortion of the cylinder will cause one or

more sections of the piston to yield and the sticking of the piston which has heretofore so taken place will be obviated.

While I have shown a particular embodiment of my invention for constructing a piston which is adapted to be compressed circumferentially under the pressure which as is exerted by the cylinder walls upon the sleeve of an expanding piston, yet it is not sleeve of an expanding piston, yet it is not my intention to be limited to the particular construction shown, as the invention is capable of various modifications and it is my so intention to cover broadly a piston having a sleeve which is adapted to be compressed circumferentially by the pressure exerted by the cylinder walls when the piston is expanding so that the piston will at all speeds 96 and temperatures of the motor, have a snug and temperatures of the motor, have a snug sliding fit within the cylinder, which will prevent any rattling of the piston. What I claim as new and desire to secure

by Letters Patent, is:

1. In combination with the cylinder of an internal combustion engine, a piston comprising a head and a sleeve, said sleeve being automatically circumferentially compressible under the pressure exerted by the 106 cylinder walls upon said sleeve when said

ston expands.

2. In combination with a cylinder for an sternal combustion engine, a piston cominternal combination engine, a piston com-prising a head and a sleeve integral there-with, said sleeve being automatically com-pressible under the pressure exerted by the cylinder wall upon said sleeve when said

sinder wan selection expands.

3. A picton for internal combustion on mea, having a head and a sloove integral netwith, said picton having a circumfer selection of therein separating a portion of the picton of th aid shove from said head and long rooves in said piston joining said evential slot, forming a section here capable of hodily movement the remainder of said.

gram, competating a band graf therewith, said place executing and thereas divi-said steers forential slot therein dividing a portlem said steeve from said head, langitudinal ri-formed on the inner peripheral surface said sleeve, said ribs having longitudin grooves therein, joining said circumferential

slot.

5. A piston for internal combustion engines, comprising a head and a sleeve integral therewith, said piston having a circumferential slot therein on a level with the rearmost piston ring, and ribs on the interior surface of said sleeve extending from the bottom of said sleeve to said slot, said with having lengthslips.

the bottom of said sleeve extending from
the bottom of said sleeve to said slot, said
10 ribs having longitudinal grooves therein
joining the ends of said dircoumfarent al slot.
6. A pisten for internal combustion engines, having a head and a sleeve, said sleeve
having a rib on its inner surface extending
the entire length of said sleeve, said sleeve
having a slot therein extending into said rib
and forming a longitudinal groove therein.
17. In an internal combustion engine, a cylinder, a piston therein comprising a sleeve
having a snug sliding fit in said cylinder at
all temperatures of said piston.
8. In an internal combustion engine, a cylinder, a piston comprising a head and sleeve
said sleeve having the portions thereof
whose peripheral surfaces are in sliding contact with the walls of said cylinder automatically circumferentially compressible under the pressure exerted by said cylinder
walls upon said sleeve when said piston axpands.
9. In an internal combustion engine, a cylpands.

9. In an internal combustion entire, a cylinder, a piston comprising a head and a
sleeve integral therewith, said sleeve having
the portions thereof whose peripheral surfaces are in sliding contact with the walls of
mid cylinder automatically circumferentially compressible under the pressure exerted by the said cylinder walls upon said
sleeve when said piston expends.

10. In an internal combustion engine, a so cylinder, a piston comprising a head and a sleeve, piston pin bosses projecting from the interior of said sleeve at a point adjacent to head of the piston, said sleeve comprising longitudinal sections some of which are as bodily movable inwardly under the pressure exerted by the walls of said cylinder upon the same as the piston expands, and others of which, which carry the piston bosses, having the portions thereof extending out free end of the sleeve also bodily movable and having their surfaces opposite the piston bosses of reduced diameter so that these portions are not in sliding contact with the 55 walls of the cylinder.

11. In an internal combustion engine, a cylinder, a piston therefor, a head and a sleeve integral therewith, piston pin bosses extending from the interior surface of said sleeve, said piston having a circumferential slot therein on a level with the rearmost piston therein on a level with the rearmost piston therein on a level with the rearmost piston rim, and ribs on the interior surface of said sleeve extending from the bottom of said sleeve extending from the bottom of said sleeve to said sleet, and the external surface of said sleeve being relieved opposite the piston pin bosses whereby said portions of the sleeve do not contact with the 70 cylinder walls.

In witness whereof I subscribe my signature in the presence of two witnesses.

In witness whereof I subscribe my signa-ture in the presence of two witnesses.

GUSTAVE E. FRANQUIST.

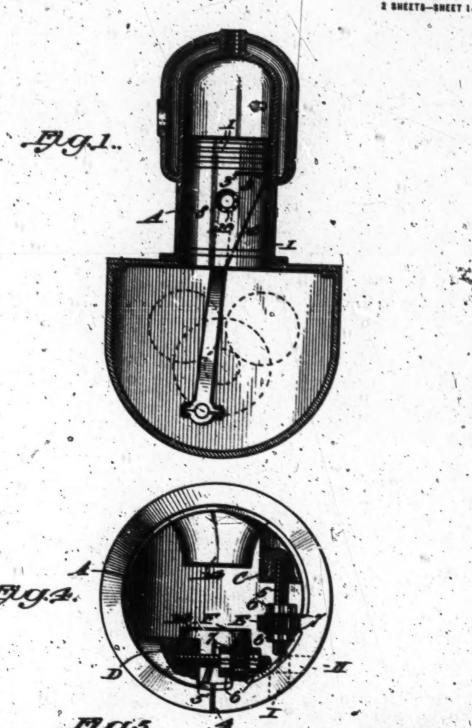
WALDO M. CHAPIN, Jula Zarawan

DEFENDANTS' EXHIBIT 4-H(6).
Prior Art Patent:
U. S. Patent No. 1,174,092, March 7, 1916,
To W. L. Schoengarth.
Adustable Gas Engine Piston.
(Filed January 27, 1934.)

W. L. SCHOENGARTH.
ADJUSTABLE GAS ENGINE PISTON.
APPLICATION FILED OCT. 1, 1915.

1,174,092.

Patented Mar. 7, 1916.

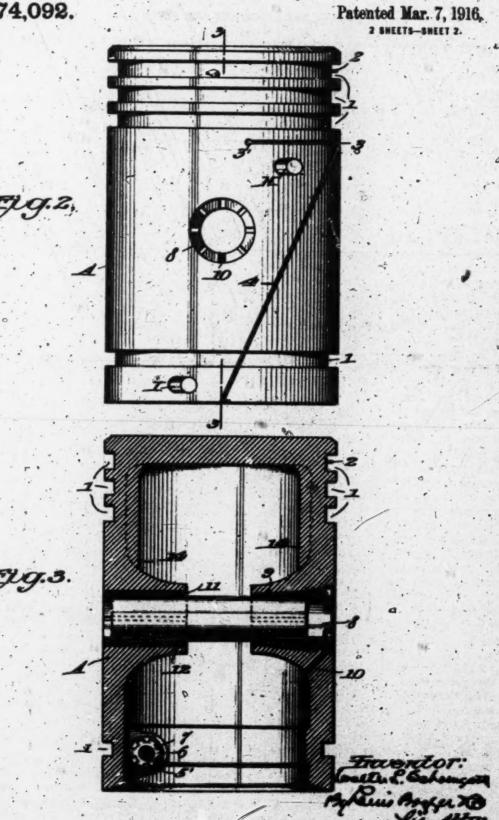


Joseph Contonily

1,174,098

W. L. SCHOENGARTH. ADJUSTABLE GAS ENGINE PISTON, APPLICATION FILED OCT. 1, 1915.

1,174,092.



UNITED STATES PATENT OFFICE

WALTER D. BOHORMOARTH, OF IRONWOOD, MICHIGAN.

ADJUSTABLE GAS-ENGINE PISTON.

1,174,092.

selfection of Letters Patent.

Patented Mar. 7, 1916.

a filed Cotabor 1, 1915. Sected No. 29,660.

To all whom it may concern:

Be it known that I, Warrin L. Somonicality, a citizen of the United States, residing at Ironwood, in the county of Gogebic and State of Michigan, have invented cartain new and useful Improvements in Adjustable Gas-Engine Pistons, of which the following is a specification.

My invention relates to an adjustable gas to engine piston, the object being to prevent what is called a piston knock and futter, and in my present invention provision is made for adjusting the size of the piston according to rule, so that it can be made to it last the lifetime of the motor. The result is, it is quiet, and without knock or fintter, thus rendering re-boring and new pistons unnecessary, prolonging the life and usefulness of the motor, and greatly reducing the cost of repair, etc.

My improved piston can be ground secording to the ideas of the repairman or builder, doing away with all rough surfaces, after which it may be adjusted to a perfect fit in the cylinder-bors.

With these objects in view, my present invention comprises a piston which is transversely and diagonally slotted on one side, with means inside for expanding the piston to fit perfectly the bore of the cylinder.

It rurther comists in business for the cross-head pin, which are expanded of quick and accourate adjustment to take up weer.

It further on which are on cross-head pin, which are on and sourcess adjustment to be In the secondarying drawing in a view of the motor in which are the position of pints at the secondary in the secondary in the position of pints. showing the position of side elevation of the pa-tional view on the line t is an end view looks

justing no

An older 1, 1, adapt ring pines a provent the rings provent the two slots

is faken up in two places, namely at the upper end of the diagonal slot and also at the lower and. The adjustment is through the two screws or stude 5 and 5' which turn so in threaded ecifics in the luga C and D located at the upper and lower ends respectively of the piston, the inner ends of these screws or stude turning in the holes in the abutments E and F respectively. Access is as gained to these screws by a serve-driver inserted through the holes H and I respectively, and jam-nuts 5 on these screws or stude have notched edges to sective the wrench 13 by which they are turned up tight 70 by the lock-washers I against the lugs C trad. D. To expland the piston to the size required, the nuts are located, and the screws are turned in the lugs to get the required expension, after which the jam-nuts 28 are tightened up against the lugs to get the required expension, after which the jam-nuts 28 are tightened up against the lugs to get the required expension, after which the jam-nuts 28 are tightened up against the lugs to get the required expension, after which the jam-nuts 28 are tightened up against the lugs to get the required expension, after which the jam-nuts 28 are tightened up against the lugs to get the perchase and published of re-bering or the purchase and published of re-bering or the purchase and published in the lugs to get this so

n lating a f

verse and longitudinal slot therethrough, and adjustable locking means located inter-

nally for expanding the piston.

2. A piston transversely and longitudis nally slotted, and screws supported on one side of the longitudinal slot and engaging a member on the opposite side thereof, whereby when turned in one direction the piston is expanded, and when turned in the 10 opposite direction it contracts by its own elasticity.

8. A piston transversely and longitudi-nally slotted, and screws supported on one side of the longitudinal slot and engaging 15 a member on the opposite side thereof, whereby when turned in one direction the piston is expanded, and when turned in the opposite direction it contracts by its own elasticity, and means for locking mid ad-

20 justing means.

4. A piston transversely and longitudinally slotted, and having holes therethrough on one side of the longitudinal slot, lugs and abutments located on opposite sides of the longitudinal slots and having orifices therein in alinement with the holes in the pistons, and screws extending through said orifices in the lugs and abutments, accessible through holes in the piston, for adjusting the piston.

5. A piston transversely and longitudi-nally slotted, and having holes therethrough on one side of the longitudinal slot, lugs and abutments located on opposite sides of the longitudinal slots and having orifices therein in alinement with the holes in the pistons, screws extending through said ori-fices in the lugs and abutments, accessible through holes in the piston, for adjusting the piston, and lock-nuts located on the screws on opposite sides of the lugs for locking the screw against turning to hold the

ston in its adjusted position.

6. The combination with a piston, of a

6. The combination with a piston, of a cross-head pin, a tapering adjustable bushing, and a take-up bushing-nut for moving the bushing endwise and contracting it around the cross-head pin.

7. The combination with a piston, of a cross-head pin, a tapering adjustable bushing, and a take-up bushing-nut for moving the bushing endwise and contracting it around the cross-head pin, the bushing-nut externally acrew-threaded to turn in a threaded criffee concentric with the outer 54 threaded orifice concentric with the outend of the bushing, and means for lockithe bushing aut against turning. ans for locking

In testimony whereof I affix my signature

WALTER L SCHOENGARTH

DEFENDANTS' EXHIBIT 4-H(7).

Prior Art Patent.

U. S. Patent No. 1,195,936, Aug. 22, 1916,

To U. White.

Piston and Piston Rod Connection.

(Filed January 27, 1934.)

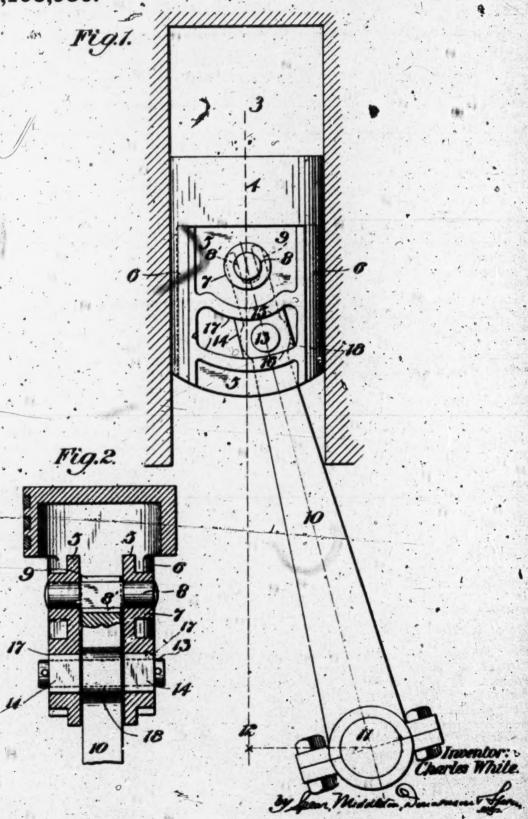
. C. WHITE.

PISTON AND PISTON ROD CONNECTION.

APPLICATION FILED AUG. 7, 1915. RENEWED JULY 20, 1916.

1.195.936.

Patented Aug. 22, 1916.



UNITED STATES PATENT OFFICE.

CHARLES WHITE, OF BALTIMORS, MARYLAND.

PINTON AND PINTON-BOD COMMECTION.

1.195,936.

Specification of Letters Patent. Patented Aug. 22, 1916.

Application fled August 7, 1918, Serial No. 44,508. Renowed July 25, 1916. Serial No. 110,383.

To all whom it may concern:

Be it known that I, CHARLES WHITE, a citizen of the United States, residing at Baltimore, Maryland, have invented certain new and useful Improvements in Pistor, and Piston-Rod Connections, of which the following is a specification.

The invention consists in the features and

combination and arrangement of parts here-inafter described and particularly pointed

out in the claims.

In the drawings; Figure 1 is a diagrammatic view of a cylinder and piston with the connecting rod and crank. Fig. 2 is a longitudinal sectional view of the piston with the connecting rod in place partly in section.

with the connecting rod in place partly in section.

In these drawings I show diagrammatically a cylinder 8 with its piston 4. This piston is formed with a cylindrical head portion and a reduced lower portion consisting of transverse walls 5 connecting the segments or sides 6 which conform in curve to the wall of the cylinder. In these transverse walls 5 bearings are provided for a pin 8, said bearings being indicated as 7. The pin 8 has cylindrical ends adapted to turn in these bearings and a central portion 8 with flat sides. This central portion is engaged by the slotted or forked upper end 9 of the connecting rod 10, which at its other end is connected with the crank pin 11, the center of the crank being indicated at 12 in line with the axis of the cylinder and piston.

The driving connection or wrist pin connection between the piston and the connecting rod is provided by a pin 13 carried by blocks 14 having curved upper and lower surfaces 15 and 16 conforming to the curved walls of guide-ways 17 formed in the side walls 5. These guide-ways are concentric with the center of the pin 8.

The connecting rod 10 has an enlarged portion at 18 through which the wrist pin 14 the center of the pin 8.

The connecting rod 10 has an enlarged portion at 18 through which the wrist pin 15 the center of the pin 8.

18 extends. There is one of the guide bloc 14 for each end of the wrist pin 18, the conceting rod engaging the central particle of said wrist pin as shown in Fig. 3, whi also illustrates the fact that the connecting rod works between the side with a walls. The power from the pisten is transmitted to the connecting rod through the wrist p 18 and conversely the pull of the connection rod, for instance on the section struke is transmitted to the pisten through the manifest pin 18, this being in contra-distincting

wrist pin 18, this bein

to the usual practice in which the power is transmitted through a pin located in the plane of the axial center of the piston and immovably fixed in relation to said axial plane, as would be the case were the con-necting rod 10 pivoted to the piston only

by the pin 8.

It will be observed from Fig. 1 that with It will be observed from Fig. 1 that with the crank on its quarter stroke the connecting rod extends at an angle to the axis of the piston and that the wrist pin lies to one side of said axis and on the same sidethere of upon which the crank pin is now located. As the crank turns and the connecting rod approaches the axial plane of the piston the wrist pin 13 chifts in the guide 17 and approaches the axial plane until when the parts are on dead centers, the wrist pin 12 will be lying directly in the axial plane of the piston and as the crank continues to move and the crank-opin departs from the dead center and moves toward its other quarter stroke position the wrist pin will continue shifting being thus carried across the dead center and occupying positions to one side of the axial center of the piston corresponding to the angular position of the crank pin. In these movements of the connecting rod its upper end will pivot about the pin 8, it heling understood that the sole function of this pin is to control this pivotal movement and insure the shifting of the wrist pin from side to side of the axial center of the siston and it will be understood further that the pin 5 does not perform any function of transmitting the power between the piston and the connecting rod but that this function is performed entirely by the shifting wrist pin.

The shifting wrist pin takes the tail strains and the crank is taken by the centrally arranged pin 8 which meanly sole as a guide or one-troller for the wrist pin to inserte lie shift- lee

tween the piston and piston rod movable along said tracks or ways as the rod assumes different angular positions.

By my improvement I get long wearing s surfaces between the shifting block and the

curved guides of the piston.

I claim:

1. In combination with a piston and cylinder, a crank pin and connecting rod and a shifting wrist pin forming the connect between said connecting and and piston, wrist pin shifting from one side to the other of the axial line of the piston in accordance with the movement of the crank pin to one 18 side or the other of said axial line, substantially as described.

2. In combination with a piston and cylinder, a crank with its pin and connecting rod, said connecting rod being controlled by a pivot on the piston, guide means on the piston and a wrist pin to transmit the power between the piston and the connection and cylinder and the connection and cylinder and the connection and cylinder and cy tween the pisten and the connecting rod said wrist pin being guided by said guide means and shifting from side to side of the 25 center line of the piston as the connecting rod assumes different angular positions in relation to said center line, substantially as described.

8. In combination with a piston and cylso inder, a crank pin and connecting rod, a slot and pin connection between the connecting rod and piston to control the pivotal movement of said connecting rod and a wrist pin connection between said piston and connect-ing rod with a guide-way carried by the piston for the said wrist pin, substantially as described

4. In combination with a piston and cylinder, a crank and connecting rod, a shifting to wrist pin connection between the connecting rod and piston, and wrist pin moving from side to side of the axis of the piston to accord with the movement of the crank pin and controlling means to control the pivotal

movement of the connecting rod in relation as

to the piston, substantially as described.

5. In combination with a piston and cylinder, a connecting rod and crank, control-ling means consisting of a pin and slot or forked connection between the end of the se-connecting rod and the piston and a wrist pin connection intermediate the said pin and slot connection and the crank and a guide on the piston concentric with the pivot pin, mid guide receiving the wrist pin to permit the of the piston, substantially as described

6. In combination a piston, a connecting rod, means for controlling the pivotal move ment of the connecting rod in relation to the it piston, guide means on the piston concentric with said controlling means, a block or blocks movable in the guide way or ways, a wrist pin connected with the connecting rod and carried by the said block or blocks, sub-

stantially as de encribed

7. In combination with a piston and cylinder, a crank pin and connecting rod, and a shifting connection between said connecting rod and piston, said connection shifting from one side to the other of the axial line of the piston in accordance with the movement of the crank pin to one side or the other of said axial line.

8. In combination with a cylinder, a picton, piston rod and crank pin, said piston having two curved tracks or ways concentrated with each other, and a sliding connect tween the piston and piston rod a along said tracks or ways as the pis rumes different angular positions in re tion to the piston.

In testimony whereof, I affix my signature in presence of two witnesses.

CHARLES WHITE. RIOMAND B. PUL Enam A. Himmay.

DEFENDANTS' EXHIBIT 4-H(8).

Prior Art Patent.

U. S. Patent No. 1,229,540, June 12, 1917,

To E. O. Spillman.

Piston for Explosive Engines.

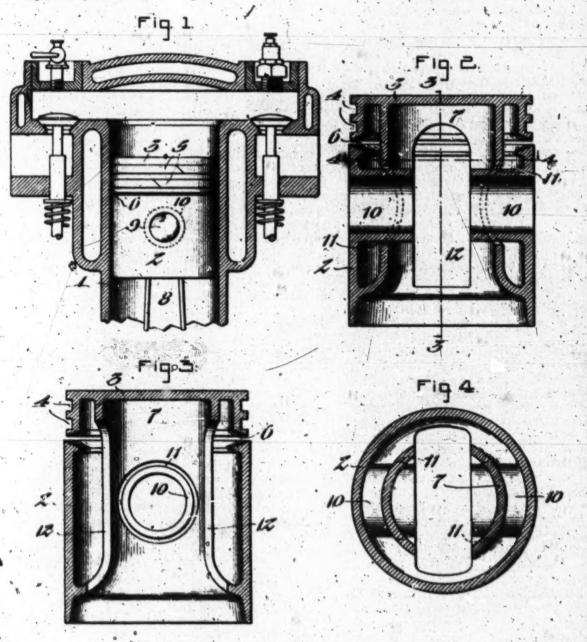
(Filed January 27, 1934.)

1704

E. O. SPILLMAN.
PISTON FOR EXPLOSIVE ENGINES.
APPLICATION FILED NOV. 11, 1916.

1,229,540.

Patented June 12, 1917.



Elward O. Spillens.

BY Sleyer DOPK

ATTORNEYS

UNITED STATES PATENT OFFICE.

EDWARD O. SPILLMAN, OF NORTH TOWAWANDA, NEW YORK.

PISTON FOR EXPLOSIVE ENGINEE

1,229,540.

Epocification of Letters Patent. Patented June 12, 1917.

Application filed November 11, 1916. Berial No. 130,833.

To all whom it may concern:

Be it known that I, EDWARD O. SPILI-MAN, a citizen of the United States, residing at North Tonawands, in the county of Nia 5 ara and State of New York, have invented new and useful Improvements in Pistons for Explosive-Engines, of which the following is a specification.

This invention relates more particularly 10 to the pistons of explosion engines or motor and is in the nature of an improvement in the piston shown and described in Letters Patent of the United States No. 1,009,870,

Patent of the United States No. 1,099,870, granted April 14, 1914, to Louis P. Mooers 15 and myself.

The object of my invention is to so construct the piston that the conduction or transmission of heat from the head to the bearings of the wrist-pin is minimised to obviate binding or undue friction of the wrist-pin and obtain the maximum efficiency of the motor.

In the accompanying descriptor.

In the accompanying drawings: Figure 1 is a fragmentary sectional elevation of a 25 motor equipped with my improved piston. Fig. 2 is an enlarged vertical longitudinal section of the piston taken through the axis of the wrist-pin bearings. Fig. 3 is a similar section on line 3—3, Fig. 2. Fig. 4 is a 30 transverse section of the same on line 4-4.

Similar characters of reference indicate corresponding parts throughout the several

1 indicates a motor-cylinder of any ordinary construction, the same forming no part of my invention.

of my invention.

2 indicates the body or guide portion of the improved piston, and 5 the head or top portion thereof which, as showneds provided with the contomacy annular grooves 5 for receiving the packing rings 5.

As in the patent above referred to, the wall of the head is preferably isolated or separated from the wall of the guide portion of the piston by a gap or space 6 of suitable width to minimise the transmission of heat from said head section to said guide section and prevent binding of the latter in the cylinder, as more fully described in said petent. In the construction shows, the two sections of the divided piston are tied together by a tabular longitudinal web 7 arranged within the sections and cast in one piece therewith, but separated from the surrounding walls thereof by a comparatively wide

pacs except at its lower end where it joins

the wall of the guide-section 2

8 indicates the usual connecting rod of the piston and 9 the wrist-pin carried by the same. This pin is journaled in suitable so bearings 10, which are preferably integral with the guide section 2 of the piston, as clearly shown in Fig. 2. They extend inwardly from diametrically-opposite sides of the wall of the guide section and pass 65 through openings 11, 11 arranged in the 8 indicates the usual connecting rod of the the wall of the guide section and pass through openings 11, 11 arranged in the tubular web 7 and made of considerably. through openings 11, 11 arranged in the tubular web 7 and made of considerably larger diameter than the external diameter of the bearings to leave a non-conducting air-gap or space between the web and the 70 hearings. This isolated construction of the bearings affectively prevents direct and excessive transmission of heat from the web to the hearings and the wrist-pin avoiding binding of the latter and reducing friction 75 to a minimum. It is apparent that in order to reach the hearings, the heat from the hot piston-head 3 has to travel downwardly throughout the length of the web 7 to the point where it joins the lower-portion of the 80 guide meeting 5 and thence upwardly to the outer ends of the bearings. Owing to this long path of travel, the reduction of temperature at the bearings is sufficient to avoid undue or objectionable heating of them and 85 the wrist pin, and inamuses as the lower portion of the piston-head to their hearings is practically reduced to a negligible dices, insuring a smooth and every operation of the wrist pin as well as the piston.

To facilitate the circulation of the oil 95 through the web, the latter may be provided in opposite sides with openings 12.

While affording the above advantage, the improvement does not increase the cost of the piston.

I claim as my invention:

100

ofted on mid cross being a second by a second

2. A pictum comprising a head-section, a mide-section forming a cross head and hav-ng its wall included from the wall of the

head-section by a non-conducting gap, a web arranged lengthwise within said sections and connecting the same, and a wrist-pin bear-ing supported on said cross head and iso-blated from said web by a non-conducting

gap.

3. A piston comprising a head-section, a guide-section isolated from the head-section by a non-conducting gap, an internal web connecting said head-section with said guide-section, and wrist-pin bearings mounted on said guide-section, eaid web being provided in opposite sides with openings for the passage of said wrist-pin bearings which are larger in diameter than the bearings, to leave

a non-conducting gap between said last-

a non-conducting gap between said lastnamed parts.

4. A piston comprising a head-section, a
guide-section isolated from the head-section
by a non-conducting gap, a tubular web arranged lengthwise within said sections and
connecting the same and provided within
the guide-section with openings, and wristpin bearings mounted on said guide-section
and extending inwardly through said openings, the bearings being isolated from the
edges of said openings by non-conducting
gaps. gaps.

EDWARD O. SPILLMAN.

DEFENDANTS' EXHIBIT 4-H(9).

Prior Art Patent.

U. S. Patent No. 1,279,184, Sept. 17, 1918,

To J. G. Vincent.

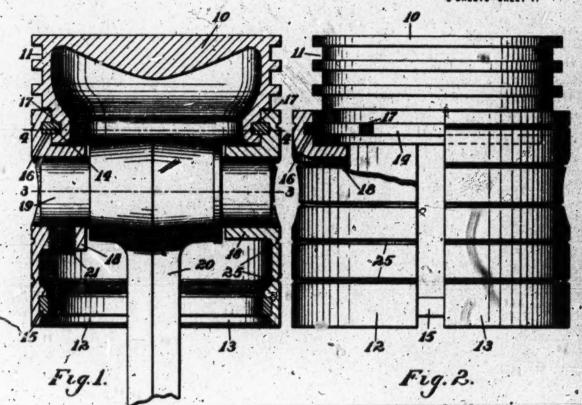
Piston.

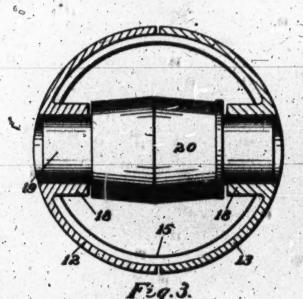
(Filed January 27, 1934.)

PISTON.
APPLICATION FILED OCT. 22, 1913.

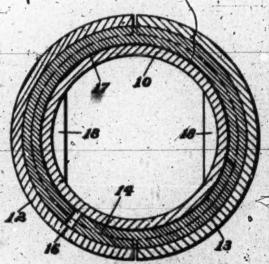
1,279,184.

Patented Sept. 17, 1918.





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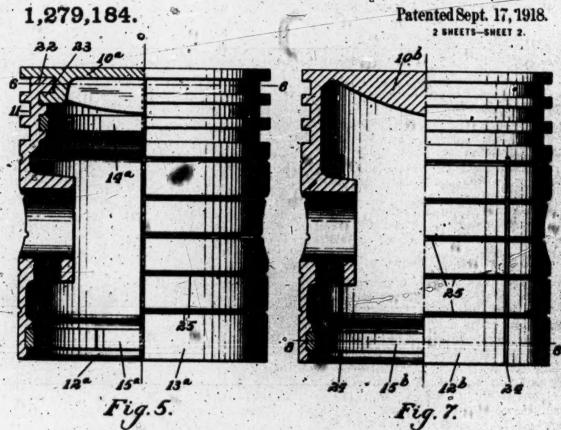
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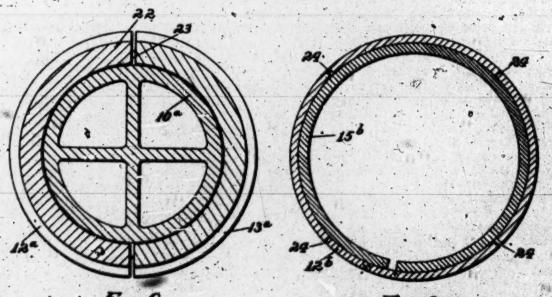


J. G. VINCENT.

PISTON.

APPLICATION FALED OCT. 22, 1913. p





Witnesses: blave I bote, & Roi J. William.

Fig. 8.
Inventor July Stimunt,
By Milla Tithette,

UNITED STATES PATENT OFFICE1711

JERRE G. VINCENT, OF DETROIT, MICHIGAN, ASSIGNOR TO PACKARD MOTOR CAR COMPANY, OF DEFECTS, MICHIGAN, A CORPORATION OF MICHIGAN.

PINTON.

1,279,184.

Patented Sept. 17, 1918. Specification of Letters Patent.

Application fled October 22, 1912, Serial No. 704,647.

To all whom it may soncern:

Be it known that I, Just G. VINCENT, citizen of the United States, and reside Detroit, Wayne county, State of Michigan, have invented certain new and useful Im-provements in Pistons, of which the follow-

ing is a specification.

This invention relates to pistons and par-

This invention relates to pistons and par-ticularly to distons for hydrocarbon motors. One of this essentials of a good hydrocar-ben motor such as may be used for motor yehicles is that the fit between the piston and the cylinder wall shall be loose enough so that the pisten will be free to operate when the motor is hot and yet shall be tight enough to minimise leakage and to prevent what is technically known as "piston dap," that is the middle movement of the piston

what is technically known as "piston disp" that is the suiden movement of the piston from one side of the cylinder to the other, usually at or during the explosion stroke.

This desired fit is of course difficult to get, and because of the fact that the top of the piston is subject to greater heat than the bottom of it, the piston is often ground to a tapered form, that is, with a greater election. Under these circumstances the heat will expand the upper part or head of the piston more rapidly than the lower part or exist and when the motor is hot the piston is substantially cylindrical in chape, thus making the therefore throughout the length of the piston about the same.

It will be seen, therefore that it is desirable that the piston about the same.

It will be seen, therefore that it is desirable that the piston about the same.

One of the length as is possible.

One of the objects of the present invention is to form a piston with a passible.

distriction of opline.

ng I make relies in a second bridge

nection with the drawings which form a part se of this specification, and in which:

Figure 1 is a longitudinal section through on made in accordance with this inven-

Fig. 2 is an elevation view of the giston shown in Fig. 1 with the parts separated somewhat and with some of them out away;

Fig. 3 is a transverse section on the line Fig. 4 is a transverse section on the line as

4 of Fig. 1;

Fig. 5 is a part elevation of another form piston made in accordance with this inof piston made in according to the line 6—6 of 70 Pig. 6 is a section on the line 6—6 of 70

ig. 7 is a view similar to Fig. 5 of anr form of the invention; and

Fig. 8 is a section on the line 8-8 of

Fig. 8 is a section on the line of the invention shown in Figs. 1 to 6, the upper portion or head of the piston is individed at 10 and it is shown as of dylindrical form and made in one piece. Suitable groove 11 are cut in the distunctional part of this head portion to take the recent parts of this head portion to take the recent parts of this head portion to take the recent parts are in two camical limitational parts 19 and 13 and those parts are adapted to be expanded against the dylinder wall by mesus of two expanding rings 16 and 13 at the upper and lower cache of the parts respectively, as shown in the drawings. The upper expanding ring 16 has a further function in that it joins the upper part of the piston to the lower or tegrantial parts. This is accomplished by fitting the rine 14 into two alimed annular grooves 16 and 17 in the skirt and head partices respectively.

to be seen to say the

ton of course being assembled before it is placed in the cylinder. Expanding rings 14° and 15° are provided as in the previous form of the invention.

In the form shown in Figs. 7 and 8, the skirt portion of the pieton is divided into four segments by means of sawing longitu-dinal grooves 24 therein. This leaves the skirt portion 12° of the piston integral with 10 the head portion 10° and in the form of dependent segments, the lower parts of which egments may be expanded against the cylinder wall as by the expanding ring 15. In this form only one expanding ring is used, 15 but two or more may be used as in the other form. The skirts of all of the pistons shown are provided with annular greoves 25 to facilitate lubrication of the piston.

It is understood that the invention is not limited to the exact details of construc shown in these various views, as it will be apparent that changes may be made and other forms, employed without departing

from the spirit or scope of the invention.

Having thus described my invention, what I claim and desire to secure by Letters Pat-

1. A piston having a yieldingly expanding skirt portion and piston pin lugs formed

wholly in said skirt portion.

2. A piston comprising a head portion and segmental parts forming the skirt portion, and means for yieldingly pressing said segas mental parts radially outward, the piston pin lugs of the piston being formed wholly in said skirt portion.

8. A piston comprising an integral cylindrical head portion, a pair of semi-cylindri-cal parts forming the skirt portion, and separately formed annular means for connect- 40

ing said portions.

4. A piston comprising an integral cylindrical head portion, a pair of semi-cylindri-cal parts forming the skirt portion, and sep-arately formed circumferential interlocking 45

connecting means for said portions.

5. A piston comprising an integral cylindrical head portion, a pair of semi-cylindrical parts forming the skirt portion, separately formed interlocking connecting means for said portions, and means for yieldingly expanding said semi-cylindrical

6. A piston comprising a cylindrical head portion adapted to contact with a cylinder wall, a pair of semi-cylindrical parts forming the skirt portion, and an interlocking connecting ring for said portions.

7. A piston comprising a head portion, a separately formed skirt portion, and an interlocking connecting ring for said portions.

8. A piston comprising a head portion, segmental parts forming the skirt portion, and means acting to connect said portions.

and means acting to connect said portions and to press said segmental parts radially as outward.

9. A piston comprising a head portion and means acting to connect said portions and to yieldingly press said segmental parts and to yieldingly press said segme radially outward

In testimony whereof I after my signature in the presence of two witnesses.

JESSE G. VINCENT.

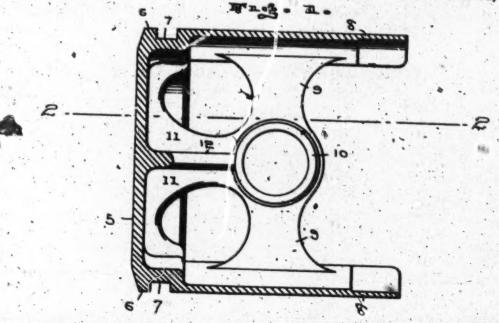
La Rot J. WILLIAMS, CLAIR J. COTTA

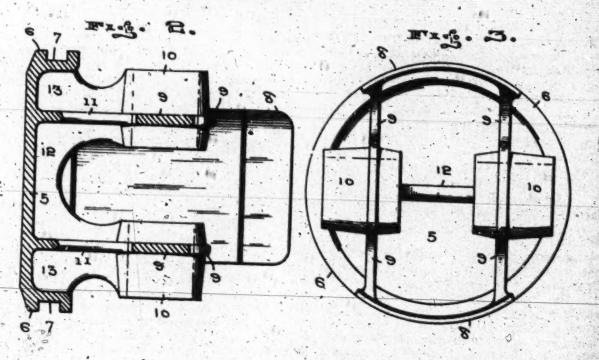
DEFENDANTS' EXHIBIT 4-H(10).
Prior Art Patent.
U. S. Patent No. 1,283,021, Oct. 29, 1918,
To C. C. Anderson,
Light Weight Piston.
(Filed January 27, 1934.)

C. C. ANDERSON.
LIGHT WEIGHT PISTON,
APPLICATION FILED OCT. 9, 1917.

1,283,021.

Patented Oct. 29, 1918.





Miliferald&Co.

UNITED STATES PATENT OFFICE 715

CHARLES C. ANDERSON, OF CEDAR RAPIDS, IOWA.

LIGHT-WRIGHT PILTON.

1,283,021.

Specification of Lothers Patent.

Patented Oct. 29, 1918.

Application filed October S, 1917. Serial No. 195,000.

To all whom it may concern:

Be it known that I, CHARLES C. ANDRESON, citizen of the United States, residing a Cedar Rapids, in the county of Linn and State of Iown, have invented certain new and useful Improvements in Light-Weight Pistons; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to

make and use the same.

This invention is in the nature of a light

This invention is in the nature of a light weight gray iron piston and cross head combined, for explosive engines and it has for its primary object to provide a combined device of the character described of improved design and make up, braced in every direction in the web, whereby, although much lighter than devices of similar character now in use, will withstand the heavy blows occasioned by the explosions in the cylinder.

The exceedingly great advantages which attend the use of light weight pistons have long been appreciated but all such light weight pistons of which I have knowledge are made of material other than gray iron of which I make my invention, being exclusively made of an aluminum mixture or alloy of some kind, or of steel or some other lighter material. Home of them, so far as I have been able to learn, have given the service desired, and for the one great makes that the material lacking in the properties which will all with stand the material lacking in the properties which will be as me sime does not possess durable qualities.

In use opting this invention my afforts.

qualities.

In very oping this invention my afforts have been divided toward making as agine pistor which vill stand the hast and strains with the vetter new in the hast and strains with the vetter new in the hast and strains which is the lifting process going as continually in the operation where their passessin a motor make 1800 production per minute.

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The recents of this are relating towards in the hearings in the quadratic permittents.

The recents of this are relating the warrent the hearings in the quadratic permittents.

The recents of this are relating the warrent the hearings in the quadratic permittents.

The recents of this are relating towards at the construction of the production of the particular the recent of the product of the recent of the particular permittents as permitted which has been called out and found to be reliable largest a country.

With the specifical purposes in view, the la-

vention consists in the improved material, and the combination, arrangement and construction of the parts hereinafter fully described and afterward specifically claimed. In order that the construction and operation thereof may be readily comprehended, in the construction and operation thereof may be readily comprehended, I have illustrated an approved embodiment of my invention in the accompanying drawing and will now proceed to fully describe the same with reference to said drawing, in which.

Figure 1 represents a sectional view of my invention on a plane cutting longitudinally and centrally through the device as to illustrated in Fig. 3. a sectional view on the plane indicated by the dotted line 2—2 in Fig. 1, and

dicated by the dotted line 3— in Fig. 1 and

Like reference characters must the mera 12
parts in all of the figures of the drawing.

Lefering particularly to the drawing.

Lefering particularly to the drawing.

Indicates the head of the Please from which extends at its direction former, the fibrit 3 and incorder to shorter the skirt and asset is
conly wide script to provide for one drawing to manifestatial groups 7, and 1 profess to

the only ring, a three-place ring for the control of the cont

while they rigidly and strongly connect the while they rigidly and strongly connect the head, the skirt, and the cross-head bearing sleeves, and are integral therewith, they are of very light weight and serve to very largely decrease the weight of the piston while giving it sufficient strength to resist all of the strains to which such pistons are subjected as well as pistons how in use and of very much greater weight.

of very much greater weight. As before stated, my piston is made of gray iron, in a single integral skeleton structure, and by virtue of its well known strength and lightness, as well as of the peculiar construction described, it will operate 10 15 equally as well as the very much heavier pi tons, while saving very largely in power required, and also equally as well as the light weight pistons of aluminum mixtures or alloys, which do not possess the durability of my piston, are entirely lacking in expansive qualities, and will not stand the heat in the

cylinders. Having thus fully described my invention, what I claim as new and desire to secure by 25 Letters Patent of the United States is:

1. A piston of gray iron consisting of a single, integral skeleton structure, comprising a head, a skirt of sufficient width to reso ating against the cylinder extending from opposite sides of the skirt, and sleeve bearings for the cross head pins supported from

2. A piston of gray iron consisting of a single, integral skeleton structure, comprising a head, a skirt of sufficient width to reing a head, a skirt of sufficient width to receive one ring only shearing pieces for operating against the cylinder extending from opposite sides of the skirt, and sleeve hear-opposite sides of the skirt, and sleeve hearing for the cross head pins supported from said hearing pieces, by means of skeleton webs extending from and connecting the opposite edges of the hearing pieces, the cross head sleeves being formed centrally of said webs and in line with each other.

8. A piston of gray iron consisting of a single, integral skeleton structure, comprising a head, a skirt of sufficient width to re-

ceive one ring only, bearing pieces for operating against the cylinder extending from sopposite sides of the skirt, and sleeve bearings for the cross head pins supported from said bearing pieces, by means of skaleton webs extending from and connecting the opposite edges of the bearing pieces, the cross head sleeves being formed centrally of said webs and in line with each other, and additional supports for the sleeve bearings comprising a skeleton web at right angles to and connecting the first named webs with the sleeves and with the inner face of the head.

4. A piston of gray iron consisting of a

eonnecting the first named webs, with the seleves and with the inner face of the head.

A piston of gray iron consisting of a single, integral skeleton structure, comprising a head, a skirt of sufficient width to receive one ring only, bearing pieces for operating against the cylinder extending from opposite sides of the skirt, and sherve bearings for the cross head pins supported from said bearing pieces, by means of skeleton webs extending from and connecting the opposite edges of the hearing pieces, the cross head sleeves being formed centrally of said webs and in line with each other, and additional supports for the alseve bearings continued in the seleves and with the inner face of the head and two webs in the plans of the last named web connecting the outer faces of the head and two webs with the sleeves and with the inner face of the first named webs onnecting the outer faces of the head and web connecting the outer faces of the first named webs with the sleeve and with the inner faces of the first named webs with the sleeve and with the serings piston comprising a head, a skirt, slide in a piston comprising a head, a skirt, slide bearings for the cylinder, extending from the skirt, also connecting the cylinder dide bearings, the woos head bearing sleeves, the inner surface of the head and the inner surface of the later.

In testimony whereoft I have signed my second two subscribing witnesses.

CHARLES C, ANDERSON.

two subscribing witnesses. ANDERSON.

L M. HOLDEN, FRANK HUMBER. DEFENDANTS' EXHIBIT 4-H(11).

Prior Art Patent.
U. S. Patent No. 1,294,833, Feb. 18, 1919,
To H. R. Ricardo.

Piston for Internal Combustion Engines.

(Filed January 27, 1934.)

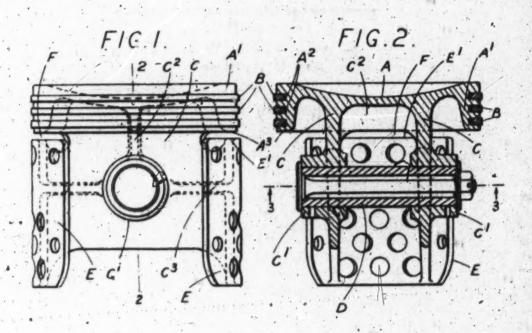


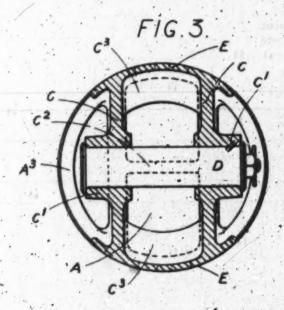
H. R. RICARDO.

PISTON FOR INTERNAL COMBUSTION ENGINES.

1,294,833.

Patented Feb. 18, 1919.





Harry R. Ricardo, Branch, Tong, Walnut Gis, attorneys.

UNITED STATES PATENT OFFICE 1719

MARRY BALPH BICARDO, OF LONDON, ENGLAND.

PINTON FOR INTERNAL COMBUSTION REGISES.

1,294,833,

Specification of Letters Palent. Patented Feb. 18, 1919.

Application filed April 28, 1918. Social No. 200,568.

To all whom it may concern:
Be it known that I, Hanner Raisen Ricamo, a subject of the King of England, residing at London, in England, have in-svented certain new and useful Improvements in Pistons for Internal-Combustion Engines, of which the following is a speci-fication.

Engines, of which the rollowing is a specification.

This invention relates to pistons for internal combustion engines and has for its object to effect certain improvements in a known type of piston in which the piston head performs solely piston functions while the guiding is performed by mambers distinguish posed on either side of the guideon pin, there guide members being extensions from the piston head flange.

In the design of puston for internal combustion engines, more especially pistons which are constructed of atominium or alternation alloy one of the difficulties which arises is due to the large clearance that must be allowed between the piston and the cylinder walls in order to permit of expansion.

In an aluminium piston of normal design if sufficient provision is made to allow for expansion when the piston attains its high-cet temperature the clearance when the parts are cold is then so great that considerable are cold is then so great that considerable

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are cold is then to great that considerable
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ded center and consequently the pions to
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other, units, and Si expects of the pions to
the pieces are emigral than a large verteing clearance a not required.

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is such that heat will be so conveyed from the piston head to the slippers as to be dis-tributed equally over the whole surfaces of the piston head to the slippers as to be distributed equally over the whole surfaces of the slippers. The webs comprise two main essemblers which may or may not he arranged parallel and are integral with and spring from the face of the piston head disk, each main portion of these webs being formed with a boss adapted to carry the gudgeon of him. The two curved guide members or slippers are oppositely disposed so as to inclose the gudgeon pin bases, these slippers being as mentioned connected to and formed integral with the webs and through 79 the latter connected to the piston head and gudgeon pin bosses.

The accompanying drawings illustrate by way of example one construction of piston in accordance with the present invention. Its In these drawings.

Figure 1 is a side elevation of the improved piston.

Fig. 2 is a sectional elevation on the line 2—8 of Fig. 1.

Fig. 5 is a transverse section on the line 3—5 of Fig. 2 looking in the direction of the arrows.

Line letters inclinate like parts throughout

the arrows.

Like letters indicate like parts throughout
the drawings.

the drawings

The best of the plates comprises a distribution of the plates comprises a distribution of the plates comprises a distribution of the conversation to the missional diameter of the cylinder that a large plate of the cylinder than the the cylinder to a cylinder than the cylinder to a cylinder than the cylinder to a cylinder than the cyli

TOIHO To transverse web C which springs from the face of the piston head A and lies between and conflects with the parallel webs C. Small supplementary webs C are also con-veniently provided across the inner side of the guide slippers E and between the webs with each of which parts these supple-

mentary webs C are integral.

As will be clearly seen in Figs. 1 and 2, the upper edge E of each curved guide mem-ber E is separated by an unbroken continuto our gap I from the adjacent opposed edge the guide members E are rigidly connected 14 to the piston head A they are not in contact

with the piston head flange. Holes are preferably made through the slippers E as shown in Figs. 1 and 2.

The two webs C serve to distribute both 20 the pressure and the heat delivered to the crown of the pisten. The whole of the thru and such heat as thus passes through the webs C are transmitted to the guide men bers E and distributed equally over them 25 owing to the manner in which the guide members are joined to the webs C. By reason of the guide members E being separated at their edges from the piston head, heat can only pass from the latter to the guide members through the webs C and then only in such a manner as to effect satisfactory and equal distribution of the heat over the guide surfaces. Moreover the total amount of heat delivered to the bearing surfaces of 35 the guide members is reduced and these surfaces can be freely lubricated. As a result of the reduced heat flow to the crosshead portion of the piston, which is composed of the guide members E and more especially as a result of the even distribution of heat over all the guide surfaces it becomes possible to provide a less clearance for expansion. In the case of a normal construction of piston the heat is transmitted from the piston head along the trunk and consequently the heat which flows the consequently the piston head along the trunk and consequently the heat which flows through the upper part of the trunk immediately beyond the niston the piston rings is excessive while toward the lower or outer end of the trunk the heat so is relatively slight.

Though the present invention is more especially interded to be employed in the construction of a piston formed of aluminium or aluminium alloy, it is to be understood as that it is equally applicable to a piston formed of cast iron, the details of construc-tion being modified or not as found neces-

asions of the slipper The shape and dis makers may be extend as also the other de-talls of the construction such as the whith of the gap between the slipper members and the pasters have finness and the ships and dis-position of the webs. Thus for analysis the bearing surface of one slipper member my

have a greater area than the bearing surface of the other slipper member, the two slipper members then being conveniently of different widths when measured in the circumfacential direction. In such a construction instead of the webs C being parallel to each other these webs may be inclined and extend between the lateral edges of one slipper member and the corresponding lateral edges.

member and the corresponding lateral edges of the other slipper member.

What I claim as my invention and desire to secure by Letters Patent is:

I. In a piston for an internal combustion engine the combination of a piston functions adapted to perform solely piston functions and comprising a disk having an integral peripheral flange in which are annular prooves, piston rings in these grooves, two grooves, piston rings in these grooves, two curved members oppositely disposed wit relation to the axis of the piston and t ether adapted to perform solely guiding unctions, each curved member being sepafunctions, each curved member being an rated from the head flange by a couting gap extending in the circumferential dir-tion, two webs which are integral with a spring from the head disk and are count to and integral with the guide members constitute the only councition between face of the piston head disk and the members, and gudgeon pin houses form these were in which they are so positions to lie between the guide members a forth.

so In a piston for an internal combustice engine the combination of a piston her adapted to perform solely piston function and comprising a disk having a relatively short integral peripheral flange in which as annular grooves, piston rings in the grooves, two curved relatively long massive oppositely disposed with relation to the axi of the piston and together adapted to perform solely guiding functions, each curve member being superated from the head flange by a continuous gap of small wide extending in the circumferential direction two webs which are integral with and again from the head disk and are contacted to an integral with the guide members and contitute the only connection between the fact of the piston head disk and the guide members, and gudgeon pin boses formed these webs in which they are so positioned to lie between the guide members as In a piston for an internal comba-gine the combination of a piston

In a photon for an internal combination of photon for the photon function of photon function of the photon functio

rated from the head flange by a continuous gap extending in the circumferential direction ion and the diameter of the guide thus formed by these two curved me slightly greater than the diameter of the piston head, two wabs which are integral with and apring from the head disk and are connected to and integral with the guide members and constitute the only connection to between the face of the piston head disk and the guide members, and gudgeon pin hor formed in these webs in which they are positioned as to lie between the guide memes as set forth.

4. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved relatively long members oppositely disposed with relation to the axis of the piston and to other adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction and the diameter of the guide thus formed by these two curved members being slightly greater than the diameter of the piston head, two webs which are integral with and spring from the head disk and are compected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and guideon pin bosses formed in these webs in which they are so positioned as to lie between the guide members as set forth.

5. In a piston for an integral combustion engine the combination of a piston head adapted to perform solely piston functions and combrising a disk having an integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flangs by a continuous gap extending in the circumferential direction, two webs which are integral with and spring from the head flangs by a continuous gap extending in the circumferential direction, two webs which are integral with and spring from the head disk and are connected to and integral with the lateral portions of the guide members and constitute the only connection head with the lateral portions of the guide members and constitute the only connection head 4. In a piston for an internal combustion engine the combination of a piston head

grooves, two curved relatively long members oppositely disposed with relation to the arise of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flanc, by a continuous see flang: by a continuous gap of small width extending in the circumferential direction two webs which are integral with and spring from the head disk and are connected to and integral with the guide members and consti-75 tute the only connection between the face of the piston head and the guide members gudgeon pin bosses formed in these webs in which there are an positioned as to lie he

of the piston head and the guide members guidgeon pin bosses formed in these webs in which they are so positioned as to lie between he guide members, and a web formed so integral with the piston head disk and extending transversely across this disk between the two main webs as set forth.

7. In a position for an internal combustion engine the combination of a piston as head adapted to perform solely piston functions and comprising a disk having an integral peripheral flange in which are annular grooves, piston rings in these grooves, two ourved members oppositely disposed with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being superated from the head flange by a continuous gap extending in the circumferential directions. rated from the head flange by a continuous gap extending in the stream terential direction, two parallel with which are integral with and spring from the head disk and are connected to and integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, and guideous pin houses formed in these webs in which they are so positioned as to lie between the guide members are forth.

8. Is a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk having a relatively short integral peripheral flangs in which are annular grooves, piston rings in these grooves, two curved relatively long members oppositely disposed with relation to the arise of the piston and together adapted to perform solely guiding functions, such curved

scross this disk between the two main webs

as set forth.

9. In a piston for an internal combustion engine the combination of a piston head adapted to perform solely piston functions and comprising a disk naving a relatively short integral peripheral flange in which are annular grooves, piston rings in these grooves, two curved and similar relatively long members oppositely distinged with relation to the axis of the piston and together adapted to perform solely guiding functions, each curved member being separated from the head flange by a continuous gap of small width extending in the circumferential direction and the diameter of the guide thus formed by these two curved members being alightly greater than the diameter of the piston head, two parallel webs which are inte-

gral with and spring from the head disk and as are connected to sud integral with the guide members and constitute the only connection between the face of the piston head disk and the guide members, guidecon pin bosses formed in these webs in which they are so as positioned as to lie between the guide members, and a web formed integral with the piston head disk and extending transversely account this disk between the two main wakes. scross this disk postween the two main wells as set forth.

In testimony whereof I have signed my name to this specification in the presence of a two subscribing witnesses.

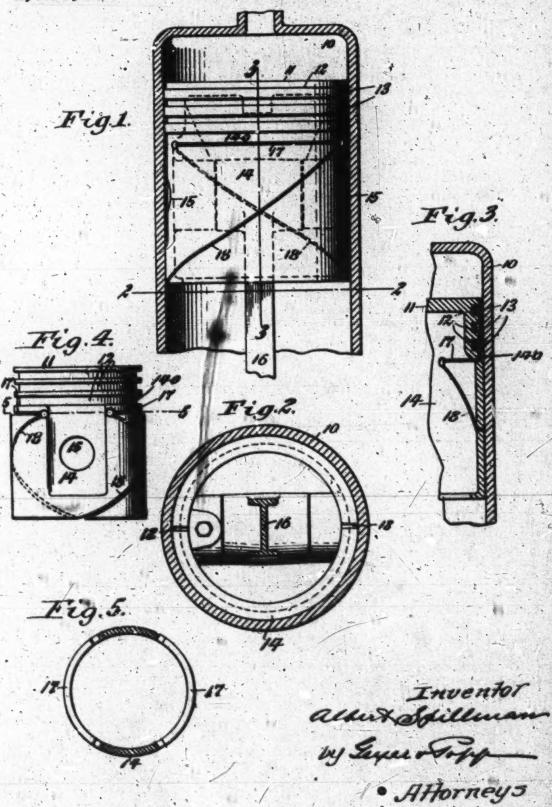
HARRY RALPH RICARDO.

J. HALL R. BAGGOTT. DETENDANTS' EXHIBIT 4-H(12).
Prior Art Patent.
U. S. Patent No. 1,325,176, Dec. 16, 1919,
To A. Spillman.
Engine Piston.
(Filed January 27, 1934.)

A. SPILLMAN.
ENGINE PISTON.

1,325,176.

Patented Dec. 16, 1919.



UNITED STATES PATENT OFFICE 725

ALBERT SPILLMAN, OF NOBTH TONAWARDA, NEW YORK.

ENGLES-PISTOR.

1,325,176.

elication of Letters Patent.

Patented Dec. 16, 1919.

Application fied February 12, 1919. Serial No. 876.465.

To all whom it may concern:

Be it knows that I, Albert Spillman, a citizen of the United States, residing at North Tonawanda, in the county of Niagara and State of New York, have invented new and useful Improvements in Engine-Pistons, of which the following is a specification.

This invention relates generally to engine-pistons, but more particularly to the type of pistons used in internal combustion engines or motors and having a skirt or tubular portion extending rearwardly from the piston-head.

The object of my invention is the produc-

The object of my invention is the production of an inexpensive self-adjusting and
non-rattling piston of this kind which may
be snugly fitted in the cylinder without danger of scoring it, and which bears uniformly
against the cylinder wall around the entire
circumference of the piston skirt and practically throughout its length.

In the accompanying drawings:
Figure 1 is a fragmentary longitudinal
section of an internal combustion enginecontaining the improved piston. Fig. 2 is a
transverse section on line 2—2, Fig. 1. Fig.
3 is a fragmentary longitudinal section on The object of my invention is the produc-

8 is a fragmentary longitudinal section on line 8—3, Fig. 1. Fig. 4 is a reduced side elevation of the piston, at right angles to 30 Fig. 1. Fig. 5 is a horisontal section on line 5-5, Fig. 4. Similar characters of reference indicate

corresponding parts throughout the several

10 indicates the engine cylinder which may be of any approved construction, and 11 indicates the solid piston head having

the customery annular grooves 19 for re-ceiving the packing rings 13.

Extending rearwardly from the piston head is the skirt or tubular body 14 which contains the customery holes or bearings 15 for the piston pin to which the rod 16 is con-nected. In order to give the skirt the neces-cery registers or contractile capacity to pre-45 cary regilience or contractile capacity to pre-vent scoring of the cylinder, it is provided at opposite sides with transverse or substan-tially horizontal slits 17 located near the uptially horizontal slits if located near the upper and of the skirt, and spiral or diagons
so slits 19 extending from one and of the horinontal clits to the rear edge of the skirt, the
spiral slits trending in exposite directions
a best shown in Fig. 1. In seem in Fig.
the lower or rear ends of the spiral slit
preferably terminate at points in line with
the centers of the respective piston-pin holes

or substantially so, while the horizontal slits or substantially so, while the horizontal sitts are formed principally in those sides of the skirt at right angles to the sides which contain the holes 15. These horizontal and spiral slits divide the skirt into a number of resilient tongues or sections of approximately triangular form which taper in opposite directions on the same side of the skirt, the small or pointed and of each tongues lying beside the wide and of the adtongue lying beside the wide-end of the ad-jacent tongue, as shown in Fig. 1.

The grooved head of the piston is slightly

smaller in diameter than the skirt, as usual, and to obtain the best results the narrow portion 140 of the skirt above its horisontal slits 17 is preferably reduced to the sa diameter as said grooved head. In the aggerated; in practice it usually does not 75 exceed eight-thousandths of an inch in a

three-inch piston.

By this construction, the skirt is rendered By this construction, the skirt is rendered resilient around its entire circumference and practically throughout its length. It may therefore be snugly fitted in the cylinder without liability of secring it, thus obtaining the maximum efficiency of the motor. With this improvement, even after the skirt of a three-insh piston wears about four-thousandths of an inch, it will still fit the cylinder closely enough to avoid knocking or not live.

cylinder closely enough to avoid mocking or ratiling.

The engine will also continue in reliable operation for a comparatively long time, insenuch as little or to oil on work part the paster into the top of the syinder, thareby preventing barning of the oil by the mark much formation of the paster lings and the production of a smoking exhius.

If the shitted portion or the strip to made, any two thousandths of an inch larger in diameter than the opinions bore, it will see an actually as a wide parameters or packing in socially as a wide parameters or packing of the shift lesing wholly disconnected from any parameter for particular from the shifting of the shift lesing wholly disconnected from any parameter for particular from the shifting of the shift lesing wholly disconnected from any parameter for particular from the shifting of the shift lesing wholly disconnected from any parameter for particular to the parameter of the paster of the paster of charges of the paster of the paster of the cylinder.

This recombes and the cylinder.

This recombes and the splitting.

vantages render the use of aluminum practicable for such pistons, thus securing the additional advantage of lightness.

In the manufacture of the piston, after it s has been slitted, the pointed ends of its resilient tongues or sections tend to spring out beyond the true cylindrical line of the piston. To avoid this, they are held in prop position by spot-welling or other suitable

10 means and the surface of the piston is then
ground to a true cylinder. The spot-welds are then removed, or if desired, they may be left in place until the piston is shipped to destination, when they are removed by the 15 user.

I claim as my invention:

1. An engine piston having a head and a resilient automatically-expansible skirt extending rearwardly from the head, said skirt 20 being tubular and provided at opposite sides near said head with transverse slits, and g spiral slits extending from said transverse slits to the rear edge of the skirt, the two oppositely-tapering sections formed by said 25 slits on the same side of the skirt being completely disconnected from each other and capable of springing inwardly and out-wardly without restraint except by the inclosing cylinder-wall when the piston is in so the cylinder

2. An engine piston having a head and a resilient automatically expansible skirt extending rearwardly from the head, said skirt being tubular and provided at opposite sides as near said head with transverse slits, and spiral slits each extending from one end of the companion transverse slit to the rear edge of the skirt, the two oppositely-tapering sections formed by said slits on the same 40 side of the skirt being completely disconnected from each other and unrestrained in their contracting and expending management. contracting and expanding movements, ex-cept by the inclosing cylinder-wall, when the piston is in the cylinder.

3. An engine piston having a head and a resilient automatically-expensible skirt extending rearwardly from the head, said skirt being tubular and having piston-pin holes

at opposite sides, transverse slits formed in the sides of the skirt substantially at right angles to those containing said holes, and spiral slits each extending from a point in the rear edge of the skirt substantially in line with one of said holes, to the farther end of one of said transverse slits, the pair of oppositely-tapering sections formed by said slits on the same side of the piston being wholly disconnected from each other and the front section of the pair being likewise disconnected from said head throughout the length of the corresponding transverse slit, said several sections being free to spring in-wardly and outwardly without restraint except by the inclosing cylinder-wall when the piston is in the cylinder.

4. An engine piston having a head and resilient tubular skirt provided at op site sides with piston-pin holes, each of the two remaining sides of the skirt comprising resilient automatically-expansible tongues is arranged circumferentially of the skirt and extending from a point near said head to the rear edge of the skirt, adjacent tongues extending in opposite directions from their fixed ends toward their free ends and being it disconnected from each other and unrestrained in their contracting and expanding movements, except by the inclosing cylinder-wall when the piston is in the cylinder.

5. An engine piston having a head and a tubular akirt extending rearwardly there-from, said skirt comprising automaticallyexpansible spring-tongues extending in a cir-cumferential series around the skirt, said eries around the skirt, said tongues being integral with said head, adja-cent tongues extending in opposite directions from their fixed ends toward their free en and the several tongues being disconnected from each other at their adjacent sides from a point near said head to the rear edge of the skirt and unrestrained in their contra ing and expanding movements except by the inclosing cylinder-wall when the piston is in the cylinder.

ALBERT SPILLMAN.

DEFENDANTS' EXHIBIT 4-H(13).

Prior Art Patent.
U. S. Patent No. 1,395,441, Nov. 1, 1921,
To E. C. Long.

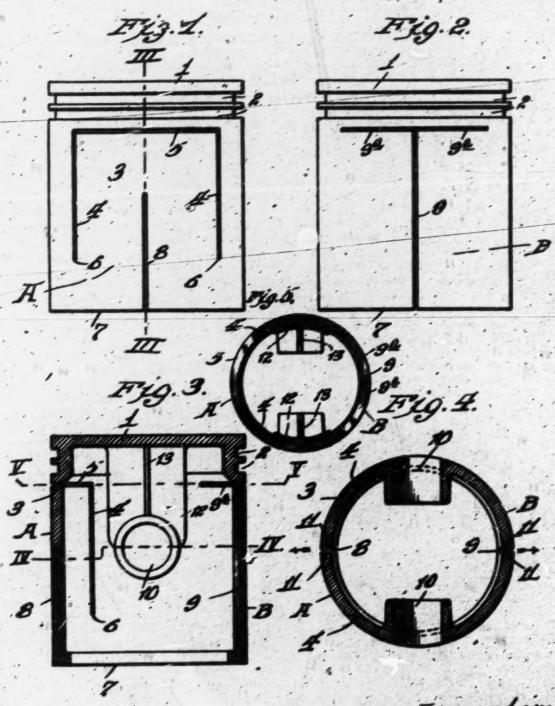
Piston.

(Filed January 27, 1934.)

E. C. LONG.
PISTON.
AFFLICATION FILED DEC. 9, 1918

1,395,441.

Patented Nov. 1, 1921.



By S. G. Krither

UNITED STATES PATENT OFFICE.

MINUTE C. LONG, OF GUINCY, INSCHOOL

Pairout.

1,395,441.

distinct of Letters Patent. Patented Nov. 1, 1931.

ation fled December 0, 1918. Serial No. 205,047.

To all whom it may concern:

Be it known that I, Exam G. Lose, a shown at 6 a distance above the citizen of the United States of America, and a resident of Quincy, in the county of Adams and State of Illinois, have invented cortain thew and useful Improvements in Pistons, of which the following is a speci-

This invention relates to improvements in

One of the objects of this invention is to

no I is a side aboution of this in-

lower ends of the slots 4 terminating a shown at 6 a distance above the lower en

P B as

end of the slot 9 will provide for the expan-adjoined intermediate of its ends by one sion and contraction of the lower end of the piston,

In a piston of this improved character it nally arranged diametrically opposed slots is preferable to have the solid end 1 of the piston of a lesser diameter across the peripheral surface adjacent the piston ring recesses 2 than the remaining lower portion of the piston, said lesser diameter adjacent the piston, said lesser diameter adjacent the control of the piston having a pair of solid slots and a piston naving a pair of solid slots and series and a piston naving a pair of solid slots and piston of a lesser diameter across the peripheral face, one of said slots and piston having a tongue-shaped porcesses 2 than the remaining lower portion of the piston, said lesser diameter adjacent the control of the piston naving a pair of solid slots and piston of a lesser diameter across the peripheral face, one of said slots being shorter than the other slot.

4. A piston naving a pair of solid slots and piston of a lesser diameter across the peripheral face, one of said slots being shorter than the other slot.

4. A piston having a tongue-shaped portion formed on its peripheral face, a longitudinally formed slot extending into said the piston of the piston of a lesser diameter across the peripheral face, one of said slots being shorter than the other slot. 10 solid end of the piston not being considered relative to this improved invention, as the usual type of piston rings mounted in the recesses will automatically take care of the proper expanding, contracting and packing

15 relation relative to said solid piston end. The slots 9 which adjoin the vertical slot 9 adjacent the piston ring recesses 2 prevent the expansion and contraction strains of the solid piston end 1 from traveling 20 directly onto the side B of the piston, in which instance said strains will be dispersed

along the wrist pin sides of the piston. In order to take care of the aforementioned backslap of the piston which is gen-25 erally given to the lewer end of pistons from the throwing-thrust of the connecting rod, attention is called to the disposition of the vertically formed slots 8 and 9 which are diametrically opposite from one another and so arranged at right angles to the wrist pin openings 10. These slots 8 and 9, however, weaken the lower portion of the piston rela-tive to the expansion and contraction thereof, but in the disposition of said slots as mentioned the bending moment of the edges 11 thereof is transferred circularly therefrom, the side portions A and B in which the slots 8 and 9 are respectively located will provide a reinforcement to the piston 40 against the connecting rod swinging-thrust.

As shown more clearly in Figs. 8 and 5, enlarged portions 12, each of which is reinforced by the rib 18, are provided for reinforcing the bearings formed by the wrist pin

openings 10. What I claim is:

1. A piston having a tongue-shaped por-tion formed on its peripheral face, and a longitudinally formed slot extending into so said tongue portion.

2. A one piece piston closed at one end and having a pair of longitudinally arranged diametrically. Sposed slots formed in its peripheral face, thereby providing disconnected peripheral portions capable of moving outwardly or inwardly without restraint, and there being a transverse slot located adjacent the closed and of the right. located adjacent the closed end of the piston

of said other slots.

A piston having a pair of longitudi-

tongue portion, and a second longitudinally formed slot diametrically opposed to said first-mentioned slot.

5. A piston having a solid end portion and a T-shaped slot formed in the peripheral face of the piston in which the transverse portion of said T-shaped slot is disposed adacent the solid end of the piston, said slot 7 forming adjacent disconnected peripheral portions which are capable of unrestrained outward and inward movement.

6. A piston having a solid end portion, a o tongue shaped portion formed on the peripheral face of the piston, having its face end located adjacent the solid end portion, and a longitudinally formed slot extending from the lower end of the piston into said tongue portion.

7. A piston having a tongue-shaped portion formed on its peripheral face, a shaped slot oppositely disposed from mid tongue shaped slot, and a longitudinally formed slot extending into said tongue por-

8. A piston having a tongue-shaped portion formed on its peripheral face, a longi-tudinally formed slot extending into said tongue portion, and a second longitudinally formed slot diametrically opposed to mid first-mentioned slot adjoining a transversely formed alot

9. A piston having a solid end portion, a tongue-shaped portion formed on the peripheral face of the piston, having its free end located adjacent the solid end portion, a longitudinally formed alot extending from the lower end of the piston into said tongue portion, and a T-shaped slot disposed opposite from said tongue portion.

from said tongue portion.

10. A one piece piston provided with a solid end portion and a skirt portion, said. skirt portion having a longitudinally ex-tending slot formed through the thickness of its wall, said slot extending from the rear edge of the skirt portion and forming ad-jacent disconnected portions in said skirt portion which are capable of being moved inwardly or outwardly without restraint.

ELMER C. LONG.

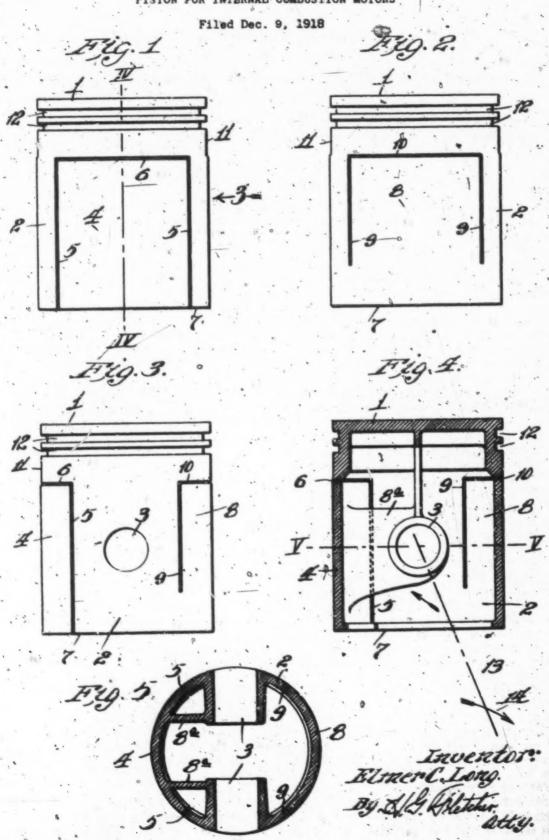
DEFENDANTS' EXHIBIT 4-H(14).
Prior Art Patent.
U. S. Patent No. 1,489,499, April 8, 1924,
To E. C. Long.
Piston for Internal Combustion Motors.
(Filed January 27, 1934.)

April 8, 1924.

E. C. LONG

1,489,499

PISTON FOR INTERNAL COMBUSTION MOTORS



UNITED STATES PATENT OFFICE

BLUEB C. LOWG, OF QUINCY, ILLINOIS.

PIETON FOR INTERNAL-COMBUSTION MOTORS.

Application filed Desember 9, 1918. Serial No. 265,946.

To all whom it may concern:

Be it known that I, Eczen C. Lone, a citisen of the United States of America, and a at their lower ends terminating at a distance resident of the city of Quincy; in the county from the end 7 of the piston.

From the aforesaid detailed construction ed certain new and useful Improvements in Pistons for Internal-Combustion Motors, of

which the following is a specification.

The primary object of this invention is to provide an improved piston for internal sombastion motors, whereby a better working relation is established between the piston and its cylinder during the operation of the motor under highly heated conditions. Another object is to provide an improve-

ment in a piston, whereby the working thrust due to the piston forcing the connecting rod is received by only one part of the piston surface, and not on the whole piston as heretofore.

Other and further objects will appear in the specification and be specifically pointed out in the appended claims, reference being had to the accompanying drawings exampli-fying the invention, and in which, Figure 1 is a side elevation of this im-

proved piston.
Figure 2 is a side elevation opposite to that

shown in Fig. 1.

Figure 3 is a side alevation taken in the direction of the arrow 3 in Fig. 1.

Figure 4 is a vertical section taken on the line IV—IV of Fig. 1.

line IV—IV of Fig. 1.

Figure 5 is a transverse section taken on the line V—V of Fig. 4.

Referring to the drawings 1 designates a solid head of the piston, 5 the main body portion, and 3 the wrist pin bearings. Formed on one side of the main body portion 2, as shown more clearly in Fig. 1, is a out out portion 4 which is formed in the periphery of the piston by the pair of longitudinal slots 5 and transverse slot 6, which adjoins the slots 5 adjacent the solid end 1 of the piston, said slots at their opposite unds continuing to the lower and 7 of the piston. The cut out portion 4 is held in its peripheral position by a pair of integrally formed connecting portions 5, each of said portions extending from each of the wrist pin bearings 3.

Formed in the plates puriphery oppose the cut cut portion 4 is a longue step ortion 8, leving its free and estend ad-not the solid and 1 of the plates, said tong portion being separated from the body por-

tion 2 of the piston by a pair of longitudinal slots 9 and a transverse slot 10, said slots 9

of this improved piston, the body portion 2 thereof having the cut away portion 4 and tongue shaped portion 8 formed therein, will be resilient, as against the ordinary type of 65 piston, and inasmuch as the exploding imulses of internal combustion motors are efective on the solid heads of the pistons, a higher temperature will be given to the solid iston end or head, as against the body por- 70 tion of the piston on which is contained the cylinder engaging portion.

In this connection, with applicant's improved construction, since the body portion 2 or cylinder engaging portion has separated 75 portions, independent contracting and expanding extents can be carried out in the piston between the body portion 2 and the

solid head 1 of the piston.

Insamuch as the cut out portions provide resiliency to the body portion 2 of the piston, in order to take care of the greatest puston, in order to take care of the greenest amount of expansion of the solid head of the piston, the periphery of the piston adjacent the solid head is made smaller in disameter than the remaining portion of the piston, as designated at 11, as the piston rings when mounted in the recesses 19 will provide the cylinder fit for the solid head 1, whereas the cut out portion 4 and tongue shaped portion 8 of the body portion 9 of the piston will yieldingly bear against the cylinder wall.

shaped portion 8 of the body portion 9 the piston will yieldingly bear against oylinder wall.

In addition to the aforesaid, in the open tion of this improved piston, when the p ton is driving the connecting red downwardly on the limited and in the direct of the arrow 16 in Fig. 4, the foreing the of the piston on the connecting red is caived by the counceting portions 8 a borne by the cut away portion a against 1 cylinder wall, thereby relieving the remaining portions of the piston from the three portions of the pust larges forth province obraied to the ton atly preve

What I dain is:

1. A one piece pieton having a portler
stirely supervised and unsupported from
a peripheral face, between the wrist piecarings thereof, the peripheral wall of all

piston which is oppositely disposed from said separated portion being slotted.

2. A piston having a portion separated and unsupported from its peripheral face, and a cut out toughte shaped portion formed in the periphery of said piston oppositely disposed from said separated portion.

3. A piston having a portion separated and unsupported from its peripheral face, means for supporting said separated portion.

means for supporting said separated portion from the interior of the piston, and a cut out tongue shaped portion formed in the periphery of said piston oppositely disposed from said separated portion.

4. A one piece full skirted hollow piston having a portion of its peripheral face en-tirely cut away, between the wrist pin bear-ings thereof thereby forming a separated peripheral portion, and supporting m secured to said separated portion and the wrist-pin bearings of the piston, for holdingsaid separated portion is

said separated portion in peripheral alinement with the peripheral face of the piston.

5. A piston having a solid end portion and a full skirt portion formed integral therewith, and there being a part of said skirt portion entirely cut away and wholly unsupported from the main body portion thereof.

6. A piston having a solid end portion and a skirt portion formed integral there-

with, there being a part of said skirt portion entirely out away and wholly unsupported from the main body portion thereof,
and there being a tongue shaped portion
formed in said skirt portion.

7. A hollow piston having a portion of
its peripheral wall entirely out away between the wrist pin bearings thereof, thereby forming a separated section, said peripheral wall bearing a slot in opposite disposition to said section and supporting means
secured to said section and the wrist pin
bearings of the piston for holding said section in alinement with the peripheral wall

8. A full skirted one piece piston having

tion in alinement with the peripheral wall.

8. A full skirted one piece piston having a portion of its peripheral wall entirely cut away and wholly separated from the remaining portion of the peripheral wall, said cut away portion being integrally supported from the interior of the piston.

9. A one piece piston having a pair of slots cut entirely through the thickness of its peripheral wall, said slots leading from the open and of the piston to a point adjacent the lowermost packing ring recess thereof and being joined by a transversely extending slot thereby forming a disconnected portion, and integral means provided for supporting said disconnected portion between said slots.

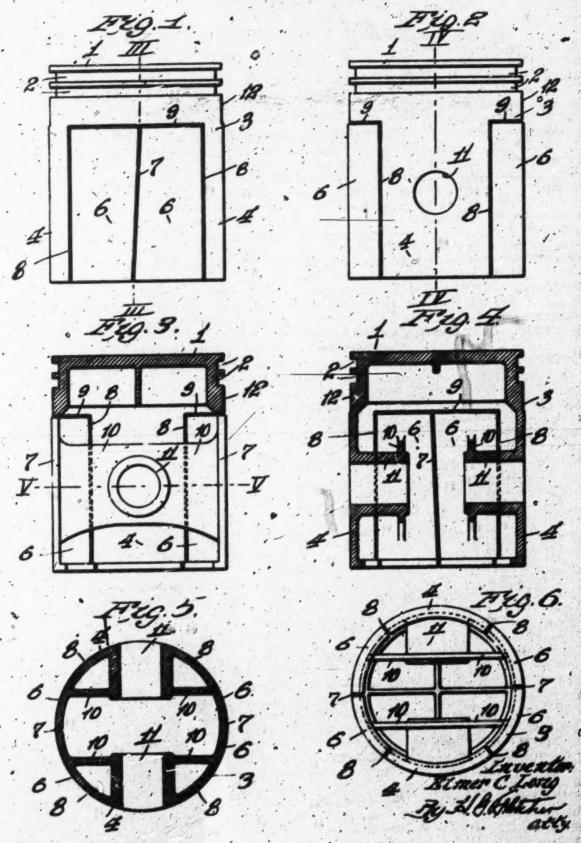
ELMER C. LONG.

ELMER C. LONG.

DEFENDANTS' EXHIBIT 4-H(15).
Prior Art Patent.
U. S. Patent No. 1,872,772, Aug. 23, 1932,
To E. C. Long.
Piston for Internal Combustion Motors.
(Filed January 27, 1934.)

PISTON FOR INTERNAL COMBUSTION MOTORS

Filed March 7, 1919



UNITED STATES PATENT OFFICE

CURRY TRUE COMPANY, OF DESCRIPTION, ASSESSOR, BY MINES ASSESSMENTER, TO SECURITY TRUE COMPANY, OF DESCRIPT, MIGHIGAN A CORPORATION OF MICHIGAN

PERSON NO INTERNAL COMPUNITION MOTORS

Application Shel March 7, 1919. Surfal No. 601,178.

The primary object of this invention is to provide an improved pister for internal combustion motors, whereby a better working relation is outskilched between the piston and its cylinder during the operation of the motor under highly heated conditions.

Another object is to provide an improvement in a pieton whereby the working threat due to the pieton forcing the connecting red is received by curtain parts of the pieton

A further object is in providing an improved picton with means formed as the portion thereof which will argue the cylinder wall, whenever, a better fitting relation on he gives to the picton whiteve to the cylinder during the mechaning of the picton that the fitting relation will be appreciate that the fitting relation will be appreciate matchy the same during the operation of the motor in which this improved picton or picton.

Other and further deposits will appear to the specification and by specifically popular out in the opposited desire, reference being had to the accompanying desiring amount from the imposition and in which

Figure 1 is a side elevation of this im-

Figure 2 is an elevation of the wrist plaside of the piston.

Figure 5 is a vertical metion taken on the ine III-III of Fig. 1.

Figure 4 is a vertical motion taken on the line IV—IV of Fig. 8

Figure 5 is a hardwarful motion taken on the line V—V of Fig. 8.

Please 6 is an elevation of the lower and

o divided from the body portion of a pieton I by the vertical alots 8 and the transverse is alot 8.

Rach cut out portion 6 is hold in its poripheral position by an integrally formed consecting portion 10, there being a pair of said consecting portions attending in opposite directions from each at the wrist pin bear-

In the construction of this improved production that I, I and I which form the orstrated postions I are predicably out in E. body postion I of the picture, and in the madiance of the picture, and in the madiance of the picture, and in the madiance of the picture, and in the picture is the picture of the picture of the large diameter than the body postion I, and the picture of the picture of the

the piston comprised of the wrist pin side 4 and separated portions 6 can expand with out fitting too tightly against the cylinds wall, as the expansion thereof will be take up by the slots 7 and 1, as expand contracting resiliancy is given to to portion 3 of the piston by the separa-tions thereof.

ns thereof.
The expanding fit gives to the body a 3 of the piston as just related will a support portion of the piston adjacent

ing thrust of the c ve to the wrist pin

of the picture, the control of the picture, the control of separate resiring of a raise

s solid and portion

ELMER C LONG.

DEFENDANTS' EXHIBIT 4-H(16).

[Second Edition.]

Prior Art Patent. British Patent No. 19,559 of 1890. To James Roots. (Filed January 27, 1934.)

N° 19,559.



Date of Application, 1st Dec., 1890 Complete Specification Left, 1st Sept., 1891 -Accepted, 3rd Oct., 1891

PROVISIONAL SPECIFICATION.

Improvements in Petroleum or Liquid Hydrocarbon Engines.

I James Rooms 24 Adam Street Portman Square W. Engineer do hereby declare the nature of this invention to be as follows:—

The object of this invention is the prevention of the leakage of vapour and the consequent smell. For cylinders asving pistons attached directly to the connecting red, in which the piston acts also us the crosshead and the cylinder as a guide I cast an addition to the front of the piston of a deep-groove or U shaped section the smaller periphery of which casting is actived or bolted to the piston and the other periphery is of the same diameter as the piston and carries a piston ring; the front view has the appearance of a disc with a long narrow slot to allow the movement of the connecting ted; the space within is deeper at the sides of the slot than at the end. The leaking vapour is caught and condensed in the space so formed and utilized for lubricating the piston, the remainder may be allowed to pass back by a pipe screwed in the cylinder or air may be drawn through it by means of a second small port. The connecting rod may be connected directly to the vapour estehing cover instead of to the piston. For engines having a crosshead and guide I make both sylindrical and place one or more rings on the periphery of the crosshead so that it acts like a second piston the space between the two catching and condensing the petroleum vapour, or passing it to the receiver.

Dated Nov. 28/90.

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JAMES BOOTS.

COMPLETE SPECIFICATION.

Improvements in Petroleum or Liquid Hydrocarbon Engines.

I, James Rooms, of 24, Adam Street, Portman Square, London, do hereby declare the nature of this invention and in what manner the same is to be performed to be particularly described and ascertained in and by the following statement :-

This invention has for its object, the prevention of any escape or leakage of petroleum vapour from the interior of the cylinder past the piston to the atmosphere, thereby avoiding the unpleasant smell usual to engines of this class as hitherto coustructed.

It consists in providing that any escape or leakage of vapour past the piston becomes pocketted and condensed in an annular or other shaped chamber fitted to the piston. A portion of the condensed vapour caught in the space so formed is utilized for lubricating purposes, the remainder may be allowed to flow back to

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Roots' Improvements in Petroleum or Liquid Hydrocarbon Engines.

the reservoir by a pipe screwed into the cylinder, or it may be again drawn into the cylinder by the suction stroke of the piston by way of a small port provided for the purpose.

for the purpose.

In order that my invention, and the manner of its application may be fully understood, I have appended the accompanying sheet of drawings, in which 5 ligures I and 2 are a sectional plan and front sectional elevation respectively of an engine cylinder, in which the piston A is attached directly to the connecting rod B, the piston acting as the crosshead, and the cylinder as a guide.

To engines of this description, I fit an additional piece C with a deep groove D, the periphery at the front end being provided with a piston ring B, the neck F is 10 of sufficient width and depth to allow of the free up and down movement of the connecting rod B (see Figure 2). In the chamber or space formed by the groove D, the vapour that passes the piston is caught and condensed to serve for lubricating purposes, as hereinbefore stated, and excess may be passed back to the reservoir by the pipe G.

Figures 3 and 4 represent the arrangement adopted for engines having crosshead and guide. The crosshead H is made cylindrical with one or more rings on its periphery forming, as it were, a second piston, the space or chamber D formed between the two pistons, pocketting and condensing the vapour in the same manner and for the same purpose, as described with reference to Figures 1 20 and 2.

and 2.

Having now particularly described and ascertained the nature of this invention and in what manner the same is to be performed I declare that what I claim is: --

In petroleum or liquid hydrocarbon engines, forming a chamber attached to 25 the piston for the purpose of catching and condensing the leaking vapour in.
(1) the manner described, and shown in Figures 1 and 2, and (2) the manner described, and shown in Figures 3 and 4.

The 1st day of September 1891.

H. GARDNER, Patent Agent, 166, Fleet Street, London, Agent for the said James Roots

Rodhill: Printed for Her Majesty's Stationery Office, by Males IG. 4971-125-11/99 A.D. 1890. Dec. 1. Nº 19,559.

ROOTS'S COMPLETS SPRITTMATION

(24 Edition)

Fig. 1.



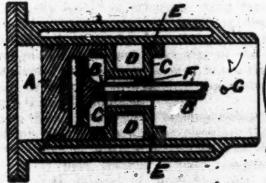
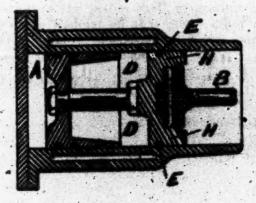




FIG. 3







DEFENDANTS' EXHIBIT 4-H(17)

Prior Art Patent. British Patent No. 17,256 of 1907, To John Vernon Pugh.

(Filed January 27, 1934.).

Nº 17,256.—A.D. 1907.

Pugh's Improvements in and relating to Motor and other Pistone.

attachment of the stays to the closed end of the piston may be effected by forming the gudgeon supporting means into a truncated cone shaped piece extending towards the back of the piston and flanging this truncated cone shaped piece at that end which comes in contact with the closed end of the piston. Also in some cases the body of the piston may be provided with a circular recess and 5 the gudgeon may be supported in a separate hat shaped piece with upturned circular stanges titting inside the piston and bearing on the boss part. This turned-up flange is pierced and provided with bearings to receive the gudgeon pin, and the central part of the hat piece extends to the closed and of the piston and is suitably bolted or otherwise fixed thereto. With this construction it is 10 not necessary to pierce the body of the piston for the reception of the gudgeon pin and the bulk of the force of the working fluid is transmitted to the gudgeon pin through the hat piece. The rim of the hat piece may if desired in some cases be riveted or otherwise secured to the recessed part of the pisten. Ventilation may be provided conveniently by piercing the rim and sides of the hat 18 piece in a suitable manner.

IN some cases in which the bracing means from the gudgeon pin bearings to the back of the piston on made circular, the closed end of the piston may be bellied outwards or inwards so as to make the forces on the closed end of the piston, mainly pure tension or pure compression.

In some cases instead of providing the open end of the piston with a strengthening groove I prefer to use a head or roll for the purpose of strengthening the open end of the same.

further in those cases in which a number of connecting-rods are used or if a single connecting-rod be divided at its end, additional supporting means for 25 the gudgeon pin may be supported on stays fixed to the rear end of the piston. In this way the centre part of a flat ended piston may be supported directly from the gudgeon pin and the pressure of the working fluid on the piston transmitted through the stays above mentioned. It is important to provide for ventilation of the piston shell to prevent overheating.

It will be understood that many other modifications might be made to this invention without departing from the spirit of the same at set out at the

invention without departing from the spirit of the same as set out at the beginning of this specification, described and destruction of the secretarial

as the energy to take a more classic Duted this 27th day of July, 1907

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18. Southampton Buildings, London, W.C. 13. Temple Street, Birmingham, and 30, Cross Street, Munchester, Jents.

than but or of terribe formed and

the off of the state of the sta COMPLETE SPECIFICATION.

"Improvements in and relating to Motor and other Platons".

I, Jone Venezox Prope of Guiring House, Allesley, in the County of Warwick, Engineer: do hereby declars the nature of this invention and in what manner the same is to be performed to be particularly described and accordanced in and by the following statement:

This invention relates to improvements in the construction of pistons of the trunk type in which the body of the piston is formed of comparatively thin metal by pressing, stamping, spinning or similar manipulating means, and especially to pistons for internal combustion motors.

Pugh's Improvements in and relating to Motor and other Pistons.

It has already been proposed to form the body of a piston in this way but

practical difficulties arise in attaching the gudgeon pin to the piston body in a manner at once secure, convenient and light.

The object of the present invention is to overcome these difficulties hitherto associated with trunk pistons made of thin, rolled or otherwise treated metal. The present invention consists broadly in providing a piston of the type above indicated, with a gudgeon pin supporting means arranged to add stability to the structure of the piston. More specifically this invention consists in attaching the gudgeon pin supporting means to the sides and or back of the piston back in such a manner as to according attach and means to the piston. 10 body in such a manner as to securely attach said means to the piston and at the same time lend a bracing or supporting effect to the rear or top face of the piston which is subjected to the pressure of the working fluid.

Referring now to the accompanying drawings which form part of this

specification:

Figure 1 shows a sectional elevation of one form of the present invention in which a hat shaped piece is secured to the flat end of the piston and also to the body of the same;

Figure 2 is a sectional elevation of a modification in which a circular cone shaped member is secured to the closed end of the piston and provided with

20 bossed portions to surround the gudgeon piu;
Figures 3 and 4 shew in elevation and plan a construction in which two separate strut-like members are attached to the sides and closed end of the piston by riveting or other means;

Figure 5 shows a construction similar to that of Figure 2, with the addition 25 of an extra supporting strut from the centre of the gudgeon pin to the closed

and of the piston;

Figures 6 to 9 illustrate various forms of closed ends for the pistons;

Figures 10 to 12 illustrate a construction in which reparate gudgeon pin supporting struts are used which are attached to the closed end and the sides of the piston, portions being continued downwards and attached at a low point to the piston. In this figure also are shown additional pieces for imparting strength to the bossed portions of the piston body, and the gudgeon supporting means. There is also shown in this figure a convenient construction of gudgeon pin provided with expanding means for securing it within the piston.

In carrying the invention into effect according to one form—say as applied to the construction of a motor piston, the body, a, of the piston is relied, stamped or otherwise formed out of thin sheet metal say—16, B. W. G. the outside form of the piston being of course provided with the usual recesses, b, for the piston ring or piston rings and with strengthening recesses, c. In addition to these recesses, there may be provided in the body, a, of the piston, a thin boss, d, on each side for the gudgeon pin but this boss would not of itself be of sufficient strength for the supporting of the gudgeon pin and the closed end, c, of the piston would not of course be sufficiently strong to give the necessary resisting strength to the pressure of the working fluid. In order

the necessary resisting strength to the pressure of the working fluid. In order to supply the cleased end, e, of the piston with this necessary strength, the end may be made dome form either concave or convex as shown in Figures 6 and 7 but this construction has the dissidvantage that it would not be applicable to the present shape and form of engine cylinders.

In the case of flat closed ends on the pistons as shown in Figures 1, 2 and 5, 1 prefer to support the gudgeon pin, , partly from the sides, a, and partly from the closed ends, e, of the piston by means of tubular mambers, g, attached to the sides and connected to the back or closed end; e, of the piston or by otrest or stay members, h, see Figures 3 and 6 attached to the sides and closed ends of the piston. This tubular member or the ends of the struts may be welded for riveted to the body of the piston as shown at, j or any other suitable form of fixing the gudgeon pin supporting means to the body of the piston may be employed. In some cases as shown in Figures 10 to 12, portions, e, of the

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I'ugh's Improvements in and relating to Motor and other Pistons.

strut-like members, A, may be continued downwards and attached to the body, a, by riveting or by other suitable means, portions of the body, a, being bulged in at the points, a, where the members, a, most the body, a, in order that the heads of the rivets when rivets are employed may lie beneath the external surface of the piston.

The gudgeon supporting means may in some cases by movided with bent over

surface of the pietes.

The gudgeon supporting means may in some cases be provided with beat over finages, \$\frac{1}{2}\$, we which they are fixed to the closed end, \$\frac{1}{2}\$, of the pietes; these finages, \$\frac{1}{2}\$, may be bent inwards as shewn in Figures 1, \$\frac{2}{2}\$, 3 and 5 or sutwards as shewn in Figures 1 on the right hand side.

The gudgeon supporting means are also provided with bossed out portions, \$\frac{7}{2}\$, to encircle the gudgeon pin. In some cases these bosses, \$\frac{7}{2}\$, we provided with strengthening pieces, \$\frac{7}{2}\$, surrounding them as shown in Figures 10 to 12.

It will be seen that by this construction, the first closed end, \$\frac{7}{2}\$, of the pieton is braced and supporting means of the stays which are connected to the gudgeon supporting means. In this way the pressure at the weaking faild is 15 transmitted from the back of the piston to a great intend the stays placed between the gudgeon supporting means and the closed end of the piston. The attachment of the stays to the diesed end of the piston may be discreted as shown in Figures 1, \$\frac{7}{2}\$, and \$\frac{7}{2}\$, provided with a circular recess, and the gudgeon reproviding means into a separate hat shaped piece axionding towards the heat of the piston may be provided with a circular recess, and the gudgeon may for the piston may be provided with bearings to receive the gudgeon pix and the contral pare of the hat piece extends to the closed end of the piston and bearing an the hour part. This turned-up fising is bitting inside the piston and bearing an the hour part. This turned-up fising is pieced or house? 25 out and provided with bearings to receive the gudgeon pix and the contral pare of the hat piece which is fixed therein. With this construction the bulk of the force of the weaking fault is framemitted to the gudgeon pix through the last piece. The rim of the hat piece may if desired in some cases be riveted or 50 otherwise secured to the recessed part of the bulk. Vantilation may be provided convenien

In some cases the thin boxes, d, on the body, a, of the piston are provided with strengthening pisces, t, which may be riveted or otherwise secured to the 35 hody, a, this modification is there in Figures 10 to 12.

In some cases in which the bracing means from the gudgeon pin bearings to the back of the piston are made circular, the closed end of the piston may be bellied outwards or invested on as to ranks the forces on the closed end of the s, mainly pure tension or pure compression, as shown in Pigures 8, 9, 40 10, 11.

In some cases instead of providing the open and of the piston with a strengthening groove, w. I prefer to use a bead or roll, v. for the purpose of strengthening the open and of the passe, as shown in Figure 2.

Further in those cases, (see Figure 5) in which a number of connecting rode 45 are used or if a single connecting rod, v. be divided at its and, additional supporting means for the gudgeon pin, f. may be provided by means of stays, q. fixed to the rear and, e. of the piston. In this way the centre part of a flat ended piston may be supported directly from the gudgeon pin and the pressure of the working fluid in the piston transmitted through the stays, q. shows to mentioned. It is important to provide for vanishing a fibe space between the gudgeon pin supporting means and the piston shell to provent overheating.

It is to be understood that the bossed strengthening pieces. I or s. described above with reference to Figures 10 to 12 may be employed with any of the other modifications described. Further in some cases as in Figures 3 and 4, 55 the basses, s, are emitted and their place is taken by plain holes in the body, s,

Pugli's Improvements in and relating to Motor and other Pistons.

of the piston, the bosses, r, in this case being extended out from the strut, portions, h, sufficiently to meet the body, a.

Any suitable arrangement for securing the gudgeon pin may be employed, the form illustrated in Figures 10 to 12 being illustrative of one form only.

It will be understood that many other modifications might be made to this

invention without departing from the spirit of the same as set out at the beginning of this specification.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed. I declare that what 10 I claim is:--

1. A trunk piston having a body formed of comparatively thin metal by pressing, stamping, spinning or similar manipulating means, and gudgeon pin supporting means arranged to add stability to the structure of the piston, said supporting means being formed of comparatively thin metal by pressing, 15 stamping, spinning or similar manipulating means, substantially as described.

2. In a piston according to Claim I, gudgeon pin supporting means comprising a tubular body part having bossed out portions projecting towards inwardly bossed portions on the piston body arranged to embrace the gudgeen pin, and attached to the closed end of the piston by riveted flanges, welding or the like with or without flanges or extended portions for attachment to the sides of the piston body near the open end, substantially as described.

3. In a piston according to Claim 1, gudgeon pin supporting means as set forth in Claim 2, additional strut members between the centre portion of the gudgeon pin and the closed piston end, substantially as described.

4. In a piston according to Claim 1, gudgeon pin supporting means comprising stamped, pressed or otherwise suitably manipulated metal strut members having bossed portions to encircle the gudgeon pin and entended portions for attachment to the closed end and sides of the piston body, substantially as described.

5. The improved pistons hereinbefore described, with reference to the secompanying drawings

Dated this 23rd day of January, 1908.

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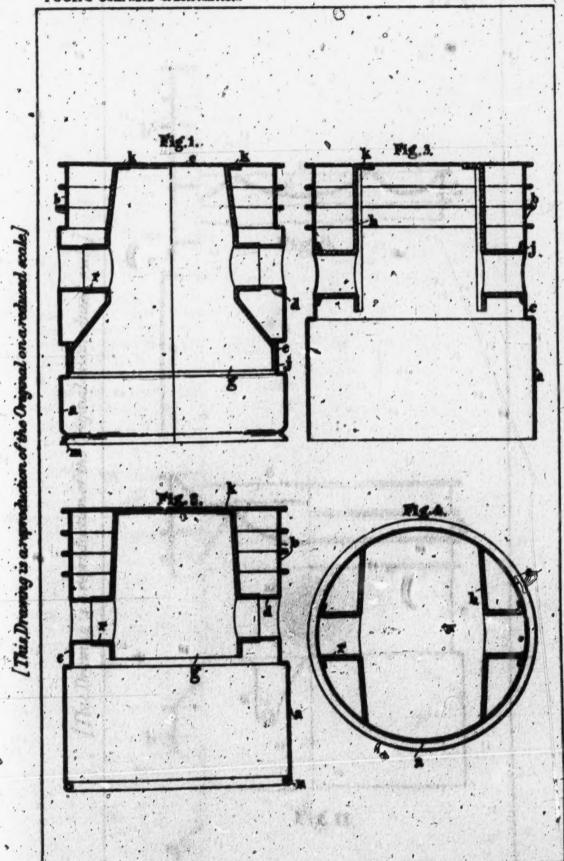
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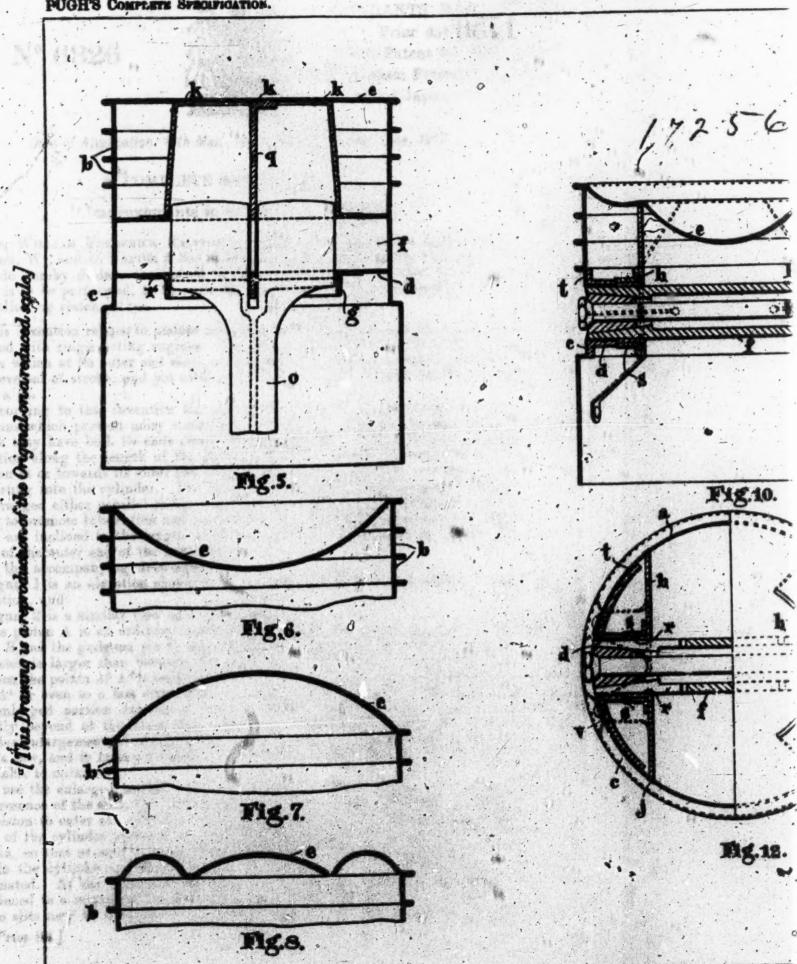
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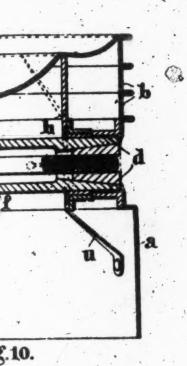


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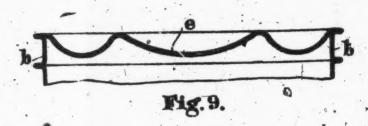
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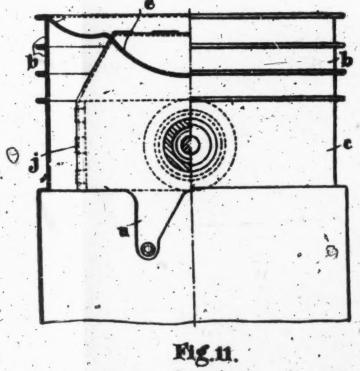


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g.12.



Nº 6826



DEFENDANTS' EXHIB Prior Art Patent. British Patent No. 6826 of 1912, William Frederick Itainforth. (Filed January 27, 1934.)

Date of Application. 19th Mar., 1912-Accepted, 20th June. 1912

COMPLETE SPECIFICATION.

Improvements in or relating to Pistons.

We, WILLIAM FREDERICK RAINFORTH, Engineer, of 1, Acaeia Road, Acton, London, W., and D. NAPIER & Sox, LIMITED, Engineers, of Acton Vale, London, W., do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by 5 the following statement:-

This invention relates to pistons and in particular to pistons of the trunk type as used with single acting engines. The object of the invention is to produce a siston which at its outer end shall so fit the cylinder as not to knock therein at the reversal of stroke, and yet such as will not be liable to seize from being too 10 good a fit.

According to this invention the piston has one end slit to provide yielding portion, which prevent noisy working. One or more slits may be used each of which may have both its ends closed and they may be made with their general direction along the length of the piston. The piston may conveniently have a portion at or towards its outer end of enlarged diameter and slit, whereby it may be sprung into the cylinder. The slits may be of any desired number and may be arranged either parallel to the direction of stroke, or inclined thereto, and in order to promote lubrication and prevent scoring, the inner end of one slit, when these are inclined to the length of the piston, may be arranged to overlap the 20 path of the outer end of the next adjacent slit.

In the accompanying drawings Pigure 1 is an elevation showing one construction of piston according to this invention, and

Figure 2 is a similar view of a modification.

The piston A is an ordinary construction so far as the inner end thereof, the rings B and the gudgeon pin C, are concerned, but between the points A1 A2 the diameter is larger than between the points A Al while the extreme outer end between the points A A is reduced either to the same diameter as that between A and A' or even to a less size. Slike D are formed in the wall of the piston at the enlarged portion extending along the whole length of that portion and alightly beyond at the inner end. Each end of each alit is terminated by a circular enlargement D which serves both to facilitate the operation of alitting with a saw, and to form a suitable termination to the slit from which evacks are not liable to occur.

In use the enfarged portion would not enter the cylinder freely, but owing to the presence of the slits, this portion can be slightly sprung sufficiently to enable the piston to enter the cylinder. The pressure of the sprung portions upon the walls of the cylinder prevents the outer end of the piston from lawing any play therein, so that at each reversal of stroke this end does not knock from side to 40 side in the cylinder and thus the noise usually arising from such knocking is eliminated. At the same time the danger of the piston seizing at this portion is reduced to a minimum owing to the springy action produced by the alits.

The slits may be arranged to any desired number and may either be paraclel

Price Bd.]

Improvements in or relating to Pistons.

to the length of the piston or inclined thereto as shown in Figure 2. When inclined to the length of the piston the inner end of one slit may be arranged to overlap the path of the outer end of the next adjacent slit, so preventing scoring. The action of the slits is further such as to promote lubrication of the outer end of the piston and this action is enhanced when the slits are inclined as shown in 5

Figure 2.

Obviously the slits may be arranged in a variety of ways; those hereinbefore described and illustrated are formed with both ends left closed, but they may, if desired be extended toward the outer end of the piston so as to be open at that end. If closed, as shown, the spring-like action of the intervening strips is 10 stiffer than if the slits are continued to the outer end of the piston. Again the slits need not necessarily be straight, although straight slits are of course easier to produce by ordinary methods than curvilinear slits. Again a U-shaped slit may be formed in the outer portion of the piston, the length of the U being transverse to the axis of the piston, and transverse slits may be arranged in a 15 variety of ways to produce springy tongue-like portions which shall produce the required result in a manner similar to that in which the slits D act.

Having now particularly described and ascertained the nature of our soid invention and in what manner the same is to be performed, we declare that we are aware that it has previously been proposed to cut slots in a piston for lightness 20 and we do not claim broadly a slotted piston, but what we do claim is:—

1. A piston slit at one end in order to provide yielding portions which prevent

noisy working substantially as described.

2. A piston according to preceding Claiming Clause No. 1 which has one or more slits with closed ends the general direction of the slits being along the 25 length of the piston.

J. A piston having a portion at or towards its end of enlarged diameter and slit whereby it may be sprung into the cylinder substantially as and for the

purpose described.

4. A piston according to any one of the preceding chaiming-clauses wherein 30 the slits are inclined to the length of the piston either so that the inner end of one slit overlaps the path of the outer end of the next adjacent slit or so as not to overlap substantially as and for the purpose described.

5. The trunk piston substantially as described and illustrated in the accom-

panying drawing.

Dated this 19th day of March, 1912.

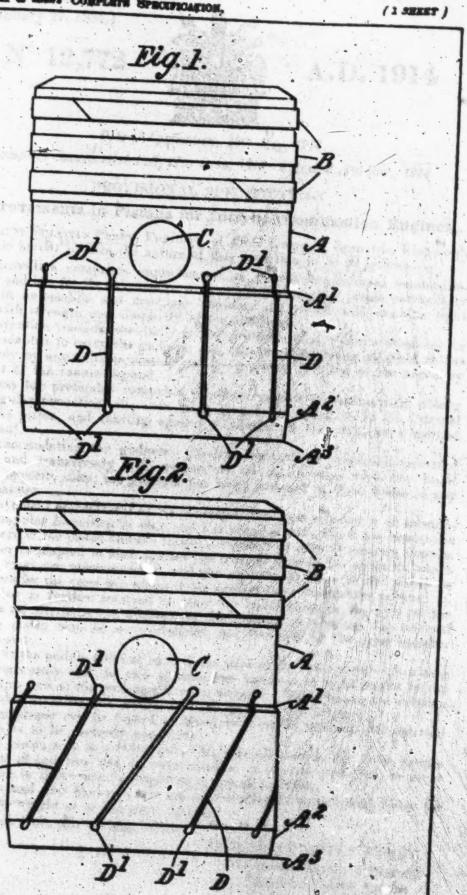
BUULT, WADE & TENNANT, 111 & 112, Hatton Garden, London, E.C., Chartered Patent Agents.

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A.D. 1913. MARCH 49. Nº 6826. RAINFORTH & others' Complete Specialization.



DEFENDANTS' EXHIBIT 4-H(19).

Prior Art Patent.

British Patent No. 12,772 of 1914,

To Samuel Octavius Ferry.

(Filed January 27, 1934.)

N° 12.772



4.D. 1914

1755

Date of Application, 25th May, 1914

Complete Specification Left, 27th June, 1914-Accepted, 3rd Dec., 1914

PROVISIONAL SPECIFICATION

Improvements in Pistons for Internal Combustion Engines.

I. SAMUEL OCTAVIUS FERST, Engineer, of Athol Lodge, S. Leonards, Ringwood, Hauts, do hereby declare the nature of this invention to be as follows:-

This invention comprises improvements in pistons for internal combustion engines, and has for its object to provide a "feutherweight" piston particularly for use in automobile and aeroplane engines, and which will combine light.

weight with strength and simplicity of construction.

The invention consists essentially in the provision of a separate cross bur or member adapted to carry the gudgeon pin, this cross bar being attached to the piston body by any suitable means, and being slotted to allow of the necessary movement of the connecting-rod.

The cross har preferably comprises a hollow member of substantially oblong or rectangular formation, the ends being turned or formed to fit the internal here of the piston, and abutting against a shoulder on the piston or a reduced

bore thereof. 15 For accommodating the guilgeon pin the member is preferably provided centrally and transversely with respect to its main axia, with two bored houses, on epposite sides, the gudgeon pin being fastened in these bosses in any suitable manner.

In a convenient embodiment of the invention, the cross member is of substantially rectangular formation in plan and has rounded ends which are concentric

with the bore of the piston and are turned accurately so as to fit securely therein. The member is adapted to abut against the reduced bore of the piston in which the piston rings are accommodated, and the working pressure of the piston on load is taken by the cross bar where it fits against the reduced bore reterred to.

25 The cross bar is further retained in place by rivets through the wall of the piston. As an alternative or addition to this manner of securing, the internal bore of the piston may be serew-threaded and the ends of the cross member threaded to mit.

Disposed at the middle point of each of the sides of the cross member is a boss. projecting outwardly and the axis of these two losses is at right angles to the

main or major axis of the rectangular cross member. These houses are suitably bored to enable insertion and retention of the gudgeon pin in place.

The piston proper can be turned or bored both on its internal and external diameters so as to be perfectly concentric.

The whole piston may be constructed of high tensile steel or the piston proper may be made of cost from and the cross member of steel as preferred, or other suitable metals or allows may be applicable as a preferred. suitable metals or alloys may be employed as appear desirable.

The piston and also the cross bar are advantageously drilled with holes for

reducing their weight as in the usual manner.

Dated this 23rd, day of May, 1914.

SAMUEL OCTAVIUS FEBRY.

By George Barker & Brettell, Chartered Patent Agenta, 77, Colmore Row, Mirmingham, Agents for Applicant.

[Price 88] distant subagast ere schicks f PRICE 1/

Ferry's Improvements in Platone for Internal Combustion Engines.

COMPLETE SPECIFICATION.

Improvements in Pistons for Internal Combustion Engines.

I, SAMUEL OCTAVIUS FREEY, Engineer, of Athol Lodge, S. Leonards, Ringwood, Hants, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:-

This invention comprises improvements in pistons for internal combustion of engines, and has for its object to provide a "featherweight" piston particularly for use in automobile and aeroplane engines, and which will combine light

weight with strength and simplicity of construction.

The present invention relates to pistons of the type having a separate cross-bar or member adapted to varry the gudgeon pin, this cross-bar being attached to 10 the piston body by any suitable means; and according to the invention this cross-bar comprises a hollow member of substantially oblong or rectangular formation the and being translated to first the invention that formation, the ends being turned or formed to fit the internal bore of the piston, and abutting against a shoulder on the interior of the piston or a reduced bore

For accommodating the gudgeon pin the cross-member is preferably provided centrally and transversely with respect to its main axis, with two bored bosses on opposite sides, the gudgeon pin being fastened in these bosses in any suitable

It will be understood that the invention may be embodied in several different 20 constructions and forms of piston, but I will describe as an example a convanient embodiment of the invention for nee particularly in automobile work. This embodiment is illustrated in the drawings in which:

Figure 1 represents a longitudinal view in cross-section taken on line 1-1 of Figure 2.

Figure 2 is a view similar to Figure 1 but turned through an angle of 90° and being taken on line 2—2 of Figure 1.

Figure 3 is a cross sectional view on line 3 -3 of Figure 1.

The piston body (which is represented by the numeral 1) is itself reduced in thickness as far as is feasible so as to be particularly light and two large openings 2, 2, are formed therein to provide a further reduction in weight. At the top of the piston two grooves are provided for the accommodation of piston rings 3 and the piston at this portion is provided interiorly with a reduced hore which forms a shoulder, the function of which will be hereinafter described. The bottom end of the piston is provided with a small inwardly projecting 35 concentric flange 5 in accordance with usual practice.

The cross-member which forms the main part of the present invention is of substantially rectangular formation in plan as shown in Figure 3 and has rounded ends 7 which are concentric with the bare of the piston and are turned accurately to fit securely therein. The upper edge of the cross-member 6 is adapted to abut against the shoulder in the upper portion of the interior of the piston and the working pressure of the piston on load is taken by the cross bar 6 where it fits against this shoulder.

To retain the member 6 in position rivets 8 are provided whereby the same is firmly attached to the piston body 1. As an alternative or an addition to this 45 manner of securing the internal bore of the piston may be serew-thresded and the curved ends 7 of the cross-member itself threaded to suit.

Disposed at the middle point of each of the sides of the cross-member 6 is a boss 9 projecting outwardly and the axis a a of these two bosses is at right angles to the main or major axis & & of the rectangular member. The bosses 9 50

Perry's Improvements in Platone for Internal Combustion Engines.

are suitably bored to permit insertion of the gudgeon pin 10 in place, and to maintain the latter in position a tupered per or wedge 11 is forced through a tapered hole formed continuously through one of the bosses 3 and one end of the gudgeon pin 10.

tapered hole formed continuously through one of the bosses 3 and one end of the gudgeon pin 10.

To give further lightness to the complete device two circular perforations 13 are provided which are mediated through the ends of the rectangular member 6 and through the wall of the cylinder 1 carresponding thereto.

The piston proper 1 is turned or bared on both its internal and external diameters so as to be perfectly concentric and it will be seen from Figure 2 that 10 the body 1 is of reduced diameters at 12, the portion below this some of reduced diameter serving to not seen bearing surface to maintain the piston in alignment with respect to the cylinder when working as in usual practice.

The whole of the piston including the piston body 1 and the rectangular cross-member 6 may be formed of high tensile steel or the piston proper may be made 15 of cast from and the crois-member of steel as preferred or other suitable metals or alloys may be employed as appear desirable or advisable.

Having now particularly described and ascertained the nature of this invention, and in what manner the same is to be performed, I declare that what I claim in :-

1) A piston for me in sum soften with internal combustion engines, and of the type having a separate cross-har or member adapted to carry the gudgeon pin, the cross-har or member being attached to the piston body by any suitable means; characterised in that the cross-har comprises a hollow member of substantially ableng or rectangular formation, the ends being turned or formed to fit the internal bore of the pictor and abutting against a shoulder on the interior of the pitters or a reduced here thereof.

25 to fit the internal bore of the Distort and abutting against a shoulder on the interior of the pitters or a reduced here thereof.

26 A picton as set forth in Claim 1 wherein the cross-member is provided controlly and transversely with respect to its main axis with two bored bosses on opposite sides, the gudgets pin being fastened in these bosses in any suitable manner.

30 manner,

THE SERVE

3. A featherweight piston for use in connection with internal combustion engines constructed substantially as described and illustrated.

Dated this 26th, day of June, 1914.

SAMUEL OCTAVIUS FERRY.

KVI AL YEAR DIE! CLASS

PERSON (SAME AND STREET

By George Barker & Brettell. Chartered Patent Agents, 17, Columne Row, Birmingham, Agents for Applicant.

Rothill: Printed for Mis seajouty's Ristionery filler, by Love & Malcomeon, Ltd;-1914.

1758 A.D. 1914. MAY 25. N.: 12,772. PERRY'S COMMENTE SPECIFICATION.

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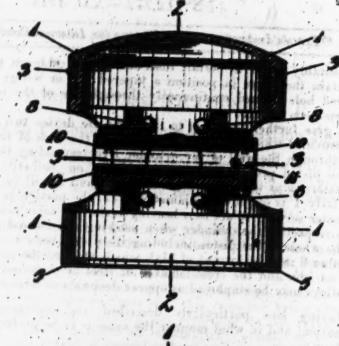
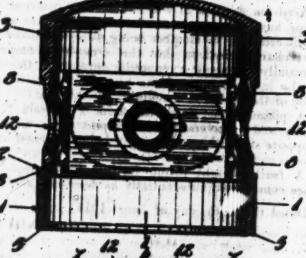
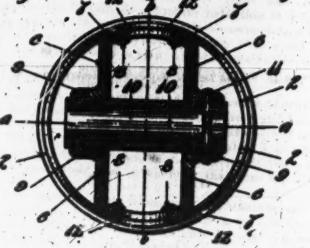


FIG. 2





DEFENDANTS' EXHIBIT 4-H(20). Prior Art Patent.

British Patent Specification No. 140,988,

[Second Edition.] To Ernest Walter Hives, July Walter (Filed January 27, 1934.) saluden elle armi beterious



140,988

PATENT ALERY CONTRACTOR IN



Application Cate, Nov. 4, 1916, No. 27,168/10. Complete Accepted, Apr. 8, 1989.

COMPLETE SPRCIFICATION

Improvements in Pictons for Reciprocating Engines.

We, Entrary Waterm Hives, of Station Road, Michledger, Dorby, Engineer, and Rolls-Royce Libertup, of Nighthurale Boad, Comeston, Durby Motor Car Manufacturers, do hereby to use the nature of this invention and in what manner the same is to be performed, by be particularly described and associated in and by the following statement.

This invention relates to pictons of the trunk type, that is those in which the duty of the picton proper is combined with that of a promised, the walls of the evillater acting as the ennesheed guide.

In this type of picton owing to the angularity of the connecting rod at the power stroke there is a tendency to threat the picton against one side of the cylinder, which causes a noise commonly known as "picton knock" or "picton stap". This is more noticeable in internal combustion engines and especially in the combustion of the c in those engines which otherwise are comparatively noiseless.

This is generally eliminated by making the piston with a very small

In some cases however, the and desired counct be thus accured, such as for example where the piston is made of aluminium (in order to secure well known advantages) and the cylinder is of dast from in which case owing to the greater co-affected of expansion of aluminium over that of dast from it is necessary to allow a greater clearance, with the result that when the engine is started before the metals have appeared under the offset of the heat. the metals have expanded under the effect of the heat, a "knock" is perceptible. The object of this invention is to aliminate the "knock" in such

. According to this invention we attain the object by saw-outting or splitting According to this invention we attain the object by saw-cutting or suitting the skirt object of the partial of the partial distance from the lower edge of the pattern and on the side of the pattern remote from that side of the cylinder against which the pattern is thrust on the power stroke owing to the angularity of the connecting rod, and another saw out or division of the skirt axially (but preferably alightly spiralled) from the first saw out to the edge of the skirt.

In another form of our invention instead of one circumferential saw out and

an axial out from themes to the edge of the skirt we may make two stroum-

ferential new outs and an axial out extending from one to the other.

The effect of such new outs is to give an elasticity to that part of the akirt between the circumferential new out and the edge, or between the two-circumferential new out and the edge, or between the two-circumferential new out as the case may be, and thus quable us, as we do to machine that pare alightly oval so that when cold the piston is held in close contact with the other ide of the cylinder, and yet when heated that part of the skirt can contract and avoid risk of seizure.

We are aware that it is not new to the or saw-out a piston skirt axially, but such an arrangement has the disadvantage that the pressure exerted by the tongue or tongues so formed is not sufficiently distributed over the cylinder. walls and the reactions on the piston are not such as to control the piston as desired, an objection which our invention overcomes to a large extent.

The accompanying drawing illustrates one form of our invention in which there is one droumferential sew-out applied to an aluminium trunk picton for internal combustion engines. Fig. 1 being an external elevation showing the

saw-outs and Fig. 2 a section on the line A A of Fig. 1.

a is the circumferential saw out, of the axial asw-out alightly spiralled, 10 b is the gudgeon pin supported by boson b'. a are pressure retaining rings and c' page or downly to prevent same from turning, d is an oil scraper ring d' a groove and d' holes to return surples oil to crankson.

Having now particularly described and assertained the nature of our said invention, and in what manner the same is to/be performed, we declare that 15 what we claim is :-

1. A trunk piston for reciprocating engines having the skirt split or saw-out circumferentially for a portion of its circumference on the side remote from the side of the cylinder taking the side thrust due to the angularity of the connecting rod on the power stroke, and a second saw-out axially or slightly spiralled relative to the axis of the piston from the first saw-out to the edge of the skirt.

2. A trunk piston for resiprocating engines having two circumients outs on the side remote from the side of the extincte taking the side to the againstity of the commetting red on the power streke, an out from one to the other of the said dreamfermatial new outs axial o or taking the side thrust to, and a new 25 s axial or slightly spiralled relative to the axis of the piston.

2. A trunk piston for reciprocating engine w outs as claimed in Chine Ho. 1 and No. 2. treeted of aluminium with

naw cuts as clair

4. An aluminium trunk piston for reciprocating engines as illustrated in the 30 drawings.

Dated the 4th day of November, 1912.

CLAREMONT, HAYNES & Co. Vernon House, Bloomsbury Square, W.C. 1, to for the Ar

eford : Printed for Mis Majorty's Statis ry Office, by The B 3191 THE PROPERTY OF THE PARTY OF TH

DEFENDANTS' EXHIBIT 4-H(21). Prior Art Patent. French Patent No. 468,595 of 1914, To Chenard & Walcker with Translation. (Filed January 27, 1934)

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V. — Machines.

8. - Moreum artines

Piston divisé pour moteurs à explosions.

SOCIÉTÉ ANONYME DES ANCIENS ETABLISSEMENTS CHENARD ET WALCKER résident on France (Seine).

> Demandé le 18 février 1914, à 14h 40m, à Paris. Délivré le 28 avril 1914. — Publié le 9 juillet 1914.

Cette invention a pour objet un piston pour moteurs à explosions divisé transversalement en deux parties distinctes dont l'une seulement reçoit l'action des gaz au point de vue calorifique, l'autre étant aussi isolée que possible de la précédente pour éviter l'échaussement et, par suite, les grippements.

On sait que les pistons de ce genre ovali-10 sent les cylindres et, pour tâcher d'obvier à cet inconvénient, on leur a donné une section assex complexe que l'on obtient au tour à reproduire pour que, par dilatation, ils s'appliquent exactement contre la paroi du cylindre; d'autre part, dans les moteurs à très grande vitesse, on ne donne pas aux pistons un diamètre tout à fait aussi grand que celui de l'intérieur du cylindre pour éviter les grippements.

De ces differentes dispositions, il résulte que le piston se meut avec des chocs plus ou moins sensibles en produisant, per conséquent, un certain bruit.

Par cette invention, ces inconvénients sont radicalement supprimés el cela, d'une manière simple et pratique, sans nécessiter une maind'œuvre excessive puisque le piston en question sera simplement usiné au tour ordinaire, comme un piston quelconque.

Au dessin annexé donné seulement à titre démonstratif :

La fig. 1 est une vue en coupe axiale verticale du piston; et

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La fig. a est une coupe herizontale selon la ligne A-B de la fig. 1. -

Comme il a été exposé, le piston comprend deux parties distinctes superposées : la partie a, de hauteur relativement faible sur laquelle sont appliqués les segments, et la partie b, de longueur beaucoup plus grande que 40 la précédente, pour assurer un bon guidage. Ges deux parties sont complètement séparées par une gorge e, de largeur convenable, et elles sont sculement reliées par des cloisons d. au nombre de deux par exemple, comme le 45 représente le dessin; ces cloisons ayant une section aussi faible que possible.

Pendant le fonctionnement du moteur, la partie supérieure a du piston reçoit seule l'action calorifique des gaz, tandis que la partie b, 50 qui est séparée de la précédente par un mateles d'air, ne recoit que la très faible quantitée de chaleur qui lui est transmise par les membranes d'et, par conséquent, l'échaussement de cette partie è est beaucoup moindre que 55 celui d'un piston ordinaire; dans ces conditions, les grippements ont moins de chance de se produire et la pratique a même démontré qu'ils ne se produissient pas du tout.

On comprend facilement qu'un tel piston 60, eut être parfaitement juste dans son cylindre, au moins en ce qui concerne la partie è et que, par conséquent, il fonctionne absolument sans aucun bruit. Il présente donc des avantages considérables sur les pistons actuellement employés et ce résultat est obtenu par un moyen extrêmement simple.

Dans le mode d'exécution représenté, les cloisons d'qui relient les deux parties a et à du piston sont perallèles; mais il est évident qu'elles pourraient constituer un croisillon ou o être disposées de toute autre façon. On peut même remplacer ces cloisons rectilignes par une chi con unique circulaire, si on le désire, mais ayant toujours une section aussi faible que possible pour rédaire au minimum la transmission de la chaleur de la partie a à la partie à.

mbanud

Un piston pour moteurs à explosions divisé en deux parties superposées, de longueur inégale, séparées par un matelas d'air; la partie 20 de moindre développement recevant les segments et étant reliée à l'autre au moyen d'une ou plusieurs cloisons convenablement disposées, mais de section aussi réduite que possible pour éviter la transmission de la chaleur 25 de la partie qui reçoit l'action directe des gaz à l'autre partie.

SOCIÉTÉ ANONYME
DES ANCIENS ÉTABLISSEMENTS CHENARD
ET WALCKER.

Per precuration in Bonanti et Juzzus Nº 468.595

Société Anonyme

Pl. unique

des Anciens Établissements Chengré et Walcher

Fig. L.

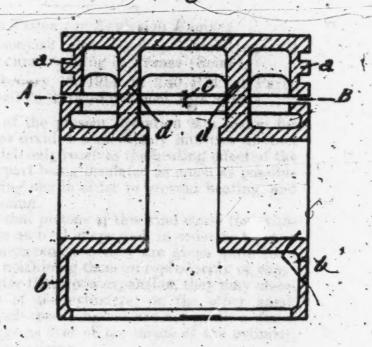
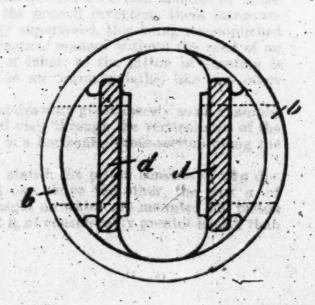


Fig. 2.



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FRENCH PATENT NO. 468595 FRENCH REPUBLIC.

National Office of Industrial Property Patent of Invention No. 468,595

V.-Machines

8.-Miscellaneous engines

Divided Piston for Explosion Engines.

Societe Anonyme des Anciens Etablissements Chenard & Walcker, residing in France (Seine)

Applied for February 18, 1914, at 2.40 P.M. at Paris, Granted April 28, 1914—Published July 9, 1914.

The object of the present invention is a piston for explosion engil es divided transversely into two distinct parts, one of which only receives the heating effect of the gases, the other part being insulated as much as possible from the preceding one in order to prevent heating, and consequently, seizing.

It is known that pistons of this kind cause the cylinders to wear into an oval shape and, in order to try and eliminate this inconvenience, they are given quite complex sections by machining them on reproducing or copying lathes, in order that upon expansion, they may closely fit the walls of the cylinders; on the other hand, the pistons in high-speed engines are not given a diameter quite as large as that of the inside of the cylinder, in order to prevent seizing.

The result of these different arrangements is that the piston moves with more or less noticeable shocks, producing as a consequence, a certain amount of noise.

By means of the present invention, these inconveniences are radically suppressed, this being accomplished in a simple and practical manner without the need of an excessive amount of labor, as the piston in question is simply machined on an ordinary lathe, like any other piston.

In the attached drawing given merely as an example, Fig. 1 is a sectional view through the vertical axis of the piston, and Fig. 2 is a horizontal cross-section along the line A-B of Fig. 1.

As previously stated, the piston consists of two distinct parts placed one above the other, the part a, of relatively lesser height on which are mounted the piston rings, and the part b, of considerably greater length than

the preceding in order to insure good guiding. The two parts are entirely separated by means of the groove c, of suitable width, and are merely connected by means of the webs d, for example two in number, as shown in the drawing, these webs having as thin a section as possible.

During the operation of the engine, the upper part of the piston alone receives the heating effect of the gases, while the part b, which is separated from the former by a cushion of air, receives but a small quantity of heat which is transmitted to it through the sections d and consequently, the heating of this part b is considerably less than that of an ordinary piston; under these conditions there is less chance of the pistons seizing and practical use has also demonstrated that no seizing at all occurs.

It will be readily realized that such a piston may be perfectly fitted in its cylinder, at least as far as the part b is concerned, and that it will consequently work without absolutely any noise. It therefore embodies considerable advantages over the pistons being used at the present time, and this result is secured by extremely sim-

ple means.

In the developed form shown herewith, the webs d which connect the two parts a and b of the piston are parallel, although it is evident that they may be of cruciform shape or be arranged in any other manner. The rectilinear webs may even be replaced by a single circular web if desired, but still having as thin a section as possible, in order to reduce to a minimum the transmission of heat from the part a to the part b.

SUMMARY

A piston for explosion engines divided into two super-posed parts of unequal length, separated by a cushion of air, the less developed portion carrying the piston rings and being connected to the other by means of one or several webs suitably disposed, but of as reduced a cross-section as possible in order to prevent the transmission of heat from the part receiving the direct action of the gases, to the other part.

Societe Anonyme des Anciens Etablissements Chenard et Walcker

Borame and Julien by Power of Attorney

Prior Art Patent. French Patent No. 434,147 of 1911. To M. Charles-Emile Serex with Translation. (Filed January 27, 1934.)

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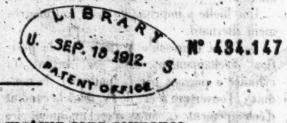
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OFFICE NATIONAL DE LA PROPRIÉTÉ INDUSTRIELLE.

BREVET D'INVENTION.

V. - Machines.

8. — Moreces arress.



Tiroir à mouvement alternatif pour moteur sans soupapes.

M. CHARLES-EMILS SEREX résident en France (Seine).

Demandé le 12 septembre 1911. Délivré le 17 novembre 1911. — Publié le 15 janvier 1911.

La présente invention a pour objet un tiroir à mouvement alternatif pou moteur sans soupapes, destiné à mettre le cylindre moleur en communication avec l'admission et 5 avec l'échappement aux instants voulus pour assurer la distribution.

Ce tiroir, qui est particulièrement applicable aux motours pourvus d'une chemise d'obturation concentrique au piston, est ca-10 ractérisé essentiellement par :

1" L'application, dans le tiroir, d'un conduit d'échappement disposé transversalement, qui offre au gus un passage direct, de 15 ment, de telle sorte que les gas peuvent s'échapper repidement sans rencontrer de résis-

chapper repidement sans rencontrer de résistance; ce conduit divise le tiroir en doux parties qui sont réunies par des entretoines latérales de forme apprapriée, en contact sons les pareis refreidles de le holte du tiroir; et la disposition de l'extrémité du tiroir, qui est fendue et forme segment élastique, de munière que la partie ploine du tiroir soit approyée contre le condait d'échappement soit approyée contre le condait d'échappement se l'obture perfaitement pendent l'adminion, la compression et l'explosion, dans le but d'éviter les rentrées de gas d'échappement dans la conduite d'aspiration des cylindres moteurs, où il règne constamment une dé-30 pression.

L'invention est représentée. mais à titre

d'exemple seulement, dans le dessin annexé, dans lequel :

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La fig. 1 est une coupe verticale du Bouveau tiroir:

oir; La fig. s bat une coupe semblable, les organes étant dans une autre position;

La fig. 3 est une coupe par A-A de la fig. 1;

Les fig. 4 et 5 sont des coupes partielles 40 par B-B et C-C de la fige 15

Comme on le voit sur es dessin, le nouveau tiroir est juxtaposé à un cylindre a, dans le-

quel est disposée une chemise d'abteration quel est disposée une chemise d'abteration mobile b, avec un système d'étanchéité e; le 45 pisten moteur se déplace dans cette chemise b.

Le tiroir d se déplace parallèlement as pisten moteur; ce tiroir est logé dans une botte cylindrique e, communiquant avec le cylindre par une lumière f.

D'autre part, cette bolte présente une ou-verture d'admission g, et une nutre ouver-ture à débouchant dans un conduit d'échap-pensent (.

Dans le tiroir est pretiqué un conduit 55 -Dans le tiroir est pretiqué un conduit 55 transversal j, destiné à permettre l'échappement; ce conduit divise le tiroir en une partie inférieure d et une partie supérieure d, qui sont réunies per des entretoises latérales k.

Le partie supérieure du tiroir porte une 60 lumière d'admission l; le bord supérieur de

cette lumière est prolongé per un trait de

02 [434.147]

scie m (fig 1), et il est fendu en n, de manière à former une sorte de segment o. l'ar un moyen approprié, par exemple par martelage, on ouvre le segment comme montré 5 fig. 5, de telle manière que, lorsque le tiroir est engagé dans sa bolte, le segment s'applique élostiquement contre la paroi intérieure de la bolte et pousse le tiroir du côté de la lumière h.

o Une bielle p imprime au tiroir son mouvement alternatif.

La fig. 1 représente le tiroir dans la position d'échappement. Les gax sortant du
cylindre a passent par la lumière f, le conb duit j, l'ouverture h et, de là, dans le conduit
d'échappement i, ainsi que l'indiquent les
flèches (fig. 3). Comme on s'en rend compte
par l'examen de cette fig. 3, les gax trouvent
un passage direct de large section; les entretoises h ne provoquent que le minimum d'étranglement. D'autre part, les gax chauds ne
sont en contact qu'avec une faible surface du
tiroir.

Le segment e, s'appliquant élastiquement so contre la paroi de la botte e, appuie le tiroir contre la paroi de la botte e, au-dessus de la lumière d'échappement h; il en résulte que les gaz d'échappement ne peuvent passer entre le tiroir et sa botte et être aspirés per les 30 autres cylindres dans le cas d'un moteur polycylindrique.

Dans la fig. 2, le tiroir occupe la position d'admission. Le mélange carburé entre dans la bolte du tiroir par la tubulure g, passe par 35 la lumière l du tiroir et la lumière f du cylindre et pénètre dans le cylindre.

Le segment e s'appliquant contre la paroi de la botte e, la paroi pleine du tiroir est appuyée contre la lumière à, de sorte que les 40 gaz d'échappement qui peuvent se trouver dans le conduit i no sont pas aspirés par le cylindre.

Les avantages du nouveau dispositif sont de permettre, dans un moteur sans soupapes 45 compartant un tiroir è mouvement alternatif, de se déharrasser rapidement des gaz d'échappement avec le contact minimum entre ces gaz et les tiroirs, ce qui est important, d'une part, pour éviter l'échaussement du moteur, d'autre part, pour amener un bon remplissage 50 avec les gaz frais pendant la période d'aspiration suivante.

La disposition des entretoises produit le minimum d'étranglement des gaz d'échappement; ces entretoises sont bien réfroidies, 55 puisqu'elles sont en contact avec les parois de la botte cylindrique e, qui sont elles-mêmes refroidies.

La nouvelle disposition a encore pour avantage d'empêcher l'aspiration des gaz d'échap- 60 pement, co qui a une grande importance pour le rendement du moteur, surtout pendant la marche au ralenti.

Les dispositions ci-dessus ne sont données qu'à titre d'exemple, les formes, dimensions 65 et dispositifs de détail fourrous varier dans tous les cas sans changer le principe de l'invention.

nasund.

L'invention a pour objet un tiroir à mouve- 70 ment alternatif pour moteur sans soupapes, caractérisé essentiellement par :

1° L'application d'un conduit d'échappement disposé transversalement dans le tiroir, offrant au gaz un passage direct de large section, avec le minimum d'étranglement;

9° Une forme d'exécution dans laquelle le corps du tiroir est divisé en deux parties réunies par des entretoises latérules en contact avec les parois refroidies de la boîte du tiroir; 80

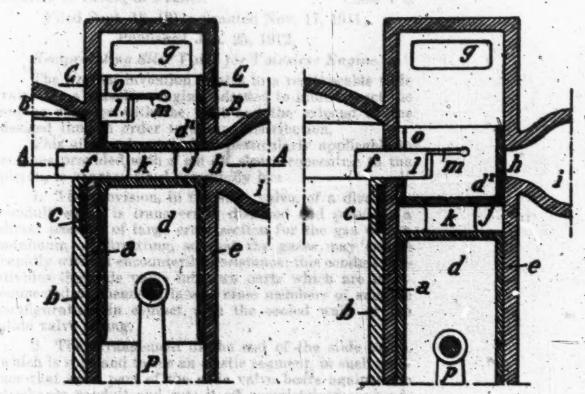
3° La disposition de l'extrémité du tiroir formant segment, de manière que la partie pleine du tiroir soit appuyée contre la partie de sa bolte où est pratiquée la lumière d'échappement et obture parfaitement cette lumière, 85 malgré les sifférences de diamètres résultant des dilatations, pendant l'admission, la compression et l'explosion, dans le but d'éviter les rentrées de gas d'échappement dans la conduite d'aspiration.

C.-E. SEREX.

Per presentine :

Fig. 1.

Fig. 2.



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FRENCH PATENT NO. 434147

Charles E. Serex, of France.

Class V 8

Filed Sept. 12, 1911; Granted Nov. 17, 1911; Published Jan. 25, 1912.

Reciprocating Slide Valve for Valveless Engine.

The present invention relates to a reciprocable slide valve for a valveless engine, adapted to interconnect the engine cylinder with the inlet and the exhaust at the desired time in order to assure distribution.

This slide valve, which is particularly applicable to engines provided with a cut-off sleeve concentric to the

piston, is characterized essentially by:

- 1. The provision, in the slide valve, of a discharge conduit which is transversely disposed and provides a direct passage of large closs section for the gas with a minimum of throttling, so that the gases may escape rapidly without encountering resistance; this conduit subdivides the slide valve into two parts which are interconnected by means of lateral cross members of suitable configuration, in contact with the cooled walls of the slide valve casing.
- 2. The arrangement of the end of the slide valve, which is split and forms an elastic segment, in such manner that solid part of the slide valve bears against the discharge conduit and cuts it off completely during admission, compression and explosion, the object being to prevent the entry of exhaust gas into the suction conduit of the engine cylinders, which is under constant reduced pressure.

The invention is illustrated, by way of example only,

on the accompanying drawings, wherein:

Fig. 1 is a vertical section through the new slide valve:

Fig. 2 is a similar section with the parts in a different position;

Fig. 3 is a section along line A-A of Fig. 1;

Figs. 4 and 5 are partial sections along lines B-B and C-C of Fig. 1.

As is shown on the drawings, the new slide valve is juxtaposed to a cylinder a, wherein is disposed a movable cut-off sleeve b provided with reinforcing means c; The engine piston moves in this sleeve b.

The slide valve d moves parallel to the engine piston; this slide valve is housed in a cylindrical casing e

which communicates with the cylinder through port hole f.

In addition, this casing is provided with an inlet opening g, and another opening h leading into a discharge conduit i.

The slide valve is associated with a transverse conduit j which permits exhaust; this conduit subdivides the slide valve into a lower portion d and an upper part d' connected by lateral cross pieces k.

The upper part of the slide valve has an inlet port l; the upper edge of this port is extended by means of a saw cut m (Fig. 1) and is split at n in such manner as to form a sort of segment o. By suitable means, for example by hammering, the segment is opened as shown in Fig. 5 so that when the slide valve is in engagement with its casing the segment bears resiliently against the inner wall of the casing and urges the slide valve against opening h.

A rod p imparts the reciprocatory movement to the slide valve.

Fig. 1 shows the slide valve in the position of exhaust. The gases leaving cylinder a pass through opening f, opening h, and thence into the exhaust conduit i, as shown by the arrows in Fig. 3. As is apparent by reference to Fig. 3, the gases are afforded a direct passage of large cross section; ribs k offer but little obstruction. In addition, the hot gases are in contact with only a small portion of the surface of the slide valve.

Segment o, bearing resiliently against the wall of casing e, urges the slide valve against the wall of casing e above the exhaust port h; consequently, the exhaust gases can not pass between the slide valve and its casing and can not be sucked in by the other cylinders in the case of a multi-cylinder engine.

In Fig. 2, the slide valve is in the position of admission. The carbureted mixture enters into the slide valve casing through port g, passes through port l of the slide valve and port f of the cylinder and thus enters into the cylinder.

Segment o bearing against the wall of the casing e, the solid wall of the slide valve is urged against port h, so that the exhaust gases which may be in conduit i are not sucked in by the cylinder.

The advantages of the new construction are that it makes possible, in a valveless engine having a reciprocating slide valve, the rapid discharge of the exhaust gases with a minimum of contact between the gases and the slide valves, which is important, first to avoid heating of the engine, and secondly to permit good charging with fresh gases during the succeeding suction period.

The arrangement of the cross pieces produces a minimum of obstruction to the exhaust gases; these cross pieces are well cooled since they are in contact with the walls of cylindrical casing e, which are themselves cooled.

A further advantage of the new arrangement is that it prevents sucking in of the exhaust gases, which is very important for the efficient operation of the engine particularly when moving slowly.

The above embodiments are given merely by way of illustration; the form, dimensions and detail arrangement may be varied without departing from the spirit of the invention.

SUMMARY:

The invention relates to a reciprocable slide valve for a valveless engine and is characterized by:

- 1. The provision of an exhaust conduit disposed transversely in the slide valve, and providing a direct passage of large cross section for the gases, said passage having a minimum of obstruction;
- 2. A modification wherein the body of the slide valve is divided into two parts connected together by cross pieces, laterally disposed, and in contact with the cooled walls of the slide valve casing;
- 3. The arrangement of the end of the slide valve in such manner that the solid part of the slide valve bears against the part of the casing where the exhaust port is located, and cuts off this port completely, despite differences in diameter due to expansion, during admission, compression and explosion, the object being to prevent entry of the exhaust gas into the suction conduit.



DEPENDANTS' EXHIBIT 4-H(23)

Prior Art Patent.

Patent No. 16,362 of 1912,

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de la nouvelle lorme d'enération du tiroir qui descent par le mêma meyen. permet de la maintagir applique qualtement : 27.1 na plus granda disambétité datre les

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Le résultat obteme est meilleur, par suite de la nouvelle forme d'exécution du tiroir qui permet de le maintenir appliqué exectement contre les parois de cylindre à l'endreit des blumières.

En outre le vide relatif régnant dans le canal g s'ajoute à l'ection de l'élasticité du tiroir pour rendre plus parfaite l'obturation lorsque la paroi du tiroir masque l'ouverture g o c'est-à-dire précisément su moment où on a besoin d'étanchéité.

násvná

La présente addition a pour objet un perfectionnement au liroir distributeur du brevet 15 principal n° 434.147 caractérisé par :

bouchant dans le tiroir, la lumière d'échappe ment dans le prolongement de la lumière venant du cylindre et la lumière d'admission 30 au-dessus de celle d'échappement.

2° L'adjonction de l'élasticité de la partie

inférieure du tiroir de la partie supérieure et obtenue par le même moyen.

3° Une plus grande étanchéité entre les orifices d'admission et d'échappement prove- 25 nant du fait que le tiroir est constamment appliqué contre eux par l'effet de son élasticité créée à ses deux extrémités comme il vient d'être expliqué au 3 s.

4° La forme hombés donnée aux fonds du 30 tireir constituent les parcis du canal d'échappement, cette forme ayant pour résultat :

a) D'éviter le grippement du tiroir par dilatation en augmentant l'étasticité des parois du canal qui le traverse, les effets de la dilatation produite par les gaz chauds traversant ledit canal étant absorbés par la partie bombée.

 b) D'augmenter la section du canal d'échappement à l'endroit où les dispositifs du brevet principal semblaient le rétrécir.

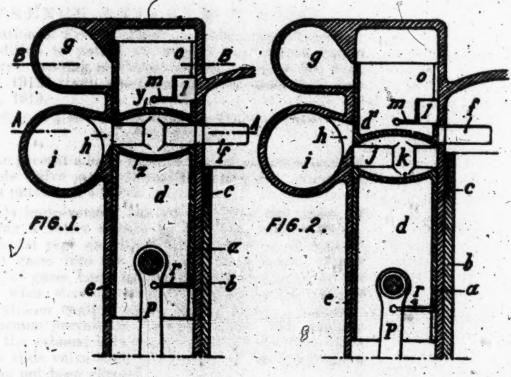
C.-E. SEREX.

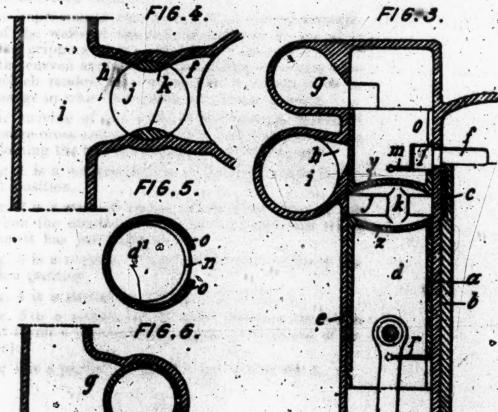
R. Grapes-Lamence.

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FRENCH PATENT NO. 16362

Translation of French patent no. 16,362, class V-8,—1st. addition to patent no. 434,147—to Charles Emile Serex residing in France (Seine), applied for Aug. 21, 1912, granted October 28, 1912, published Jan. 14, 1913.

Slide Valve with Alternating Movement for Valveless Engine.

The present addition has for object improvements in the slide valve with alternating movement, object of French patent no. 434,147.

This improvement has for its object the means of obtaining a better closure by the slide valve between the exhaust pipe and the intake so that no returns of exhaust gases into the latter will be possible. These returns of gases harm indeed the good operation of the engine when slowing down, principally in the case of multi-cylinder engines where while running a considerable vacuum prevails in the intake pipe. This vacuum causes the exhaust between the walls of the slide valve and the slide valve itself of a portion of the burnt gases if it has not been cleared.

The improvement also avoids, by a curved arrangement of the walls of the exhaust passage in the slide valve the gripping of the slide on the periphery of the walls, the curved arrangement permitting a certain elasticity which renders any expansions less dangerous in this passage in which hot gases are always passing.

The curving of the walls of the passage increases the passage cross section at the place of the lateral cross pieces joining the two bases of the exhaust passage.

Fig. 1 is a vertical section of the slide valve in the exhaust position.

Fig. 2 is a vertical section of the slide valve at the time when the admission is going to begin and when the exhaust has just finished.

Fig. 3 is a vertical section of the slide valve in the admission position.

Fig. 4 is a partial section of A-A of fig. 1.

* Fig. 5 is a section of the slide valve at the place where it forms a segment (it is supposed to be out of its cylinder).

Fig. 6 is a partial section through B-B of fig. 1.

In figs. 1, 2, 3 we see that the admission port g which in the main patent was placed above the slide valve has been moved and placed laterally above the exhaust port.

The lower part of the slide valve has been split by a saw cut r so as to form a sort of segment as in the upper part at m. This segment is hammered like n above so as to keep the slide applied against the wall of the ports g and h.

The walls y and z of the exhaust passage have been curved so as to render them more elastic and to augment the cross section of the passage in the vicinity of the cross pieces k.

The functioning of the slide valve remains the same as that described in the main patent.

The result obtained is better in consequence of the new form of construction of the slide valve which permits keeping it applied exactly against the walls of the cylinder at the place where the ports are located.

Furthermore the relative vacuum prevailing in the passage g is added to the action of the elasticity of the slide valve so as to render more perfect the closure when the wall of the slide valve masks the opening g, that is to say, precisely at the instant when we need tightness.

RESUME

The present addition has for object an improvement in the distributing slide valve of the main patent no. 434,147 characterized by:

- 1. The combination of the three ports opening into the slide valve, the exhaust port in the extension of the port coming from the cylinder and the intake port above that of the exhaust.
- 2. The addition of elasticity of the lower part of the slide valve to that of the upper part and obtained by the same means.
- 3. A greater tightness between the admission and exhaust ports coming from the fact that the slide valve is constantly applied against them because of its elasticity provided at its two ends as has been explained under (2).
- 4. The curved form given to the bases of the slide valve constituting the walls of the exhaust channel, this form having for result:

a) Avoiding the gripping (jamming) of the slide valve by expansion by increasing the elasticity of the walls of the said passage (channel) which traverses it, the effects of expansion being produced by the hot gases passing through the said channel being absorbed by the curved part.

b) Increasing the cross section of the exhaust passage at the place where the arrangements of the main

patent seemed to constrict it.

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(Filed January 27, 1934.)

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PATENTAMT.

PATENTSCHRIFT

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KLASSE 46c. GRUPPE 5.

OTTO LIETZENMAYER IN MÜNCHEN.

Kolben und Zylinder für Verbrennungskraftmaschinen.

Patentiert im Deutschen Reiche vom 3. Februar 1906 ab.

Die bei Verbrennungskraftmaschinen bis jetzt in Anwendung kommenden Arbeitskolben, in welchen zugleich das Kreuzkopflager angebracht ist, haben den Übelstand, daß die Schmie-5 rung dieses Kreuzkopigelenkes erschwert und das Nachsehen der Kreuzkopflager während des Betriebes unmöglich ist; außerdem verziehen sich bei großen Durchmessern die Kolben sehr leicht, was auf die Kraftübertragung vom 10 Kolbenboden zum Gelenkbolzen durch die Kolbenseiten zurückzuführen ist. Zum Unterschiede von diesen bekannten Bauarten wird bei dem den Gegenstand vorliegender Erfindung bildenden Kolben der Arbeitsdruck zentral durch 15 die Rippen a auf den Gelenkbolzen übertragen, und es wird ferner der führende Teil des Kolbenzylinders bei b kreuzkopfartig ausgespart, wo-durch die Führung in keiner Weise beeinträchtigt wird und bei ungleicher Materialerwärmung von Zylinder und Kolben kein Klemmen des letzteren auftreten kann. Dabei wird für die Lager der gegabelten Pleuelstange mehr Platz geschaffen, so daß bei diesen Lagern der Flächendruck geringer gehalten werden kann. Wird nun-der Zylinder auf der Kurbelseite in ähn-

licher Weise wie der Kolben so weit ausgespart, daß er als Geradeführung wirkt und daß in der äußersten Totlage des Kolbens das Gelenk gerade noch zum Vorschein kommt, so ist dadurch eine leichte Schmierung, sowie auch ein Befühlen der Kreuzkopflager mit der Hand während des Betriebes ermöglicht.

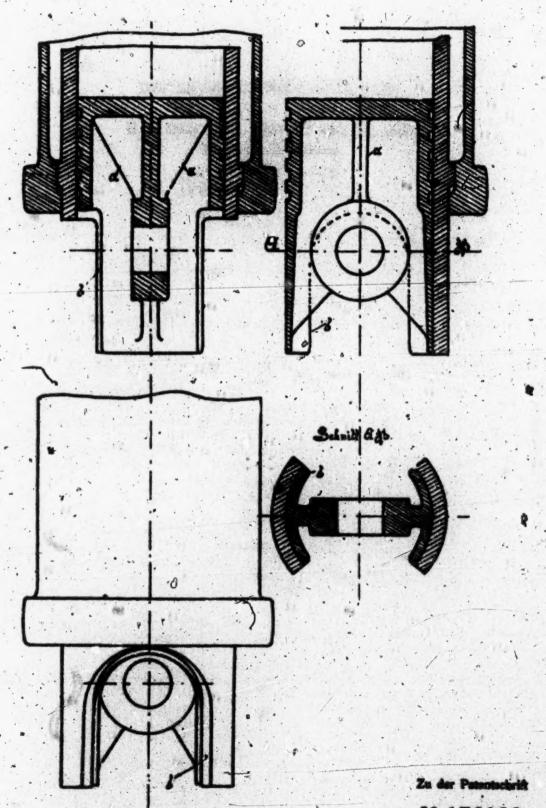
PATENT-ANSPECTE:

- r. Kolben und Zylinder für Verbrennungs- 38kraftmaschinen, dadurch gekennseichnet, daß der führende zylindrische Kolben bis zum Pleuelstangengelenk kreuzkopfartig ausgespart ist, so daß bei einer gleichen Aussparung des Zylinderendes das Gelenk in 40der äußeren Totlage sichtbar zum Vorschein kommt.
- 2. Kolben nach Anspruch I, dadurch gekennzeichnet, daß der Arbeitsdruck vom Kolbenboden auf den Gelenkbolzen durch 45 Rippen übertragen wird, die sich in der Schwingungsebene der Pleuelstange an die zylindrische Kolbenwand, in jeder anderen Richtung nur an den Kolbenboden anschließen.

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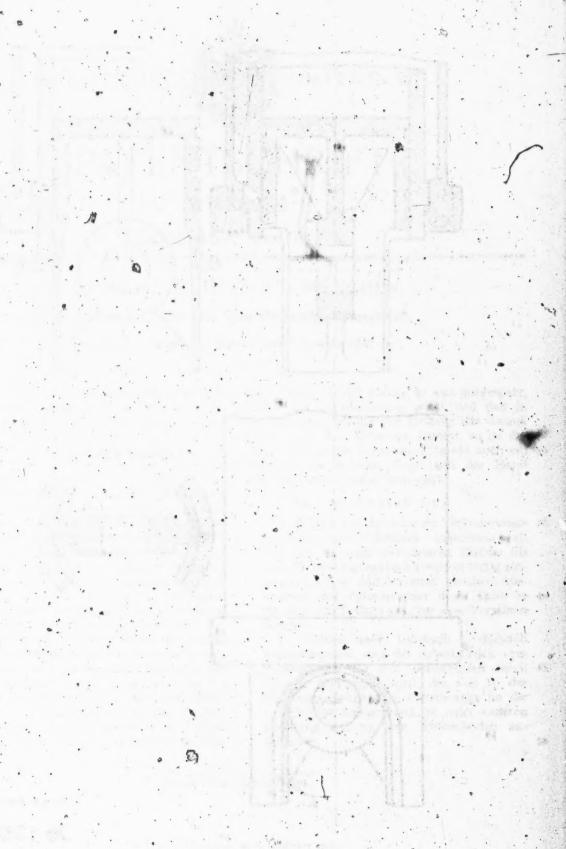
rs. Auflage, aingegeben am 30. Nevember 1916)

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DEFENDANTS' EXHIBIT 4-H(75).
Prior Art Patent.
U. S. Patent No. 1,557,625, Oct. 20, 1925,
To L. M. Spellman.
Piston Construction.
(Filed January 27, 1934.)

1790 1925.

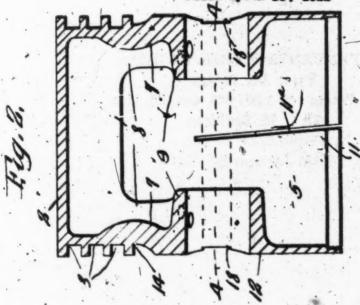
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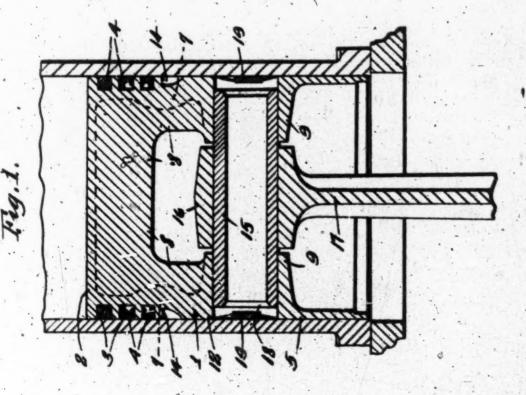
L. M. STELLMANN

PISTON CONSTRUCTION

Filed April 18, 1922

2 Sheets-Sheet 1





Low M. Stellmann

INVENTOR.

RY

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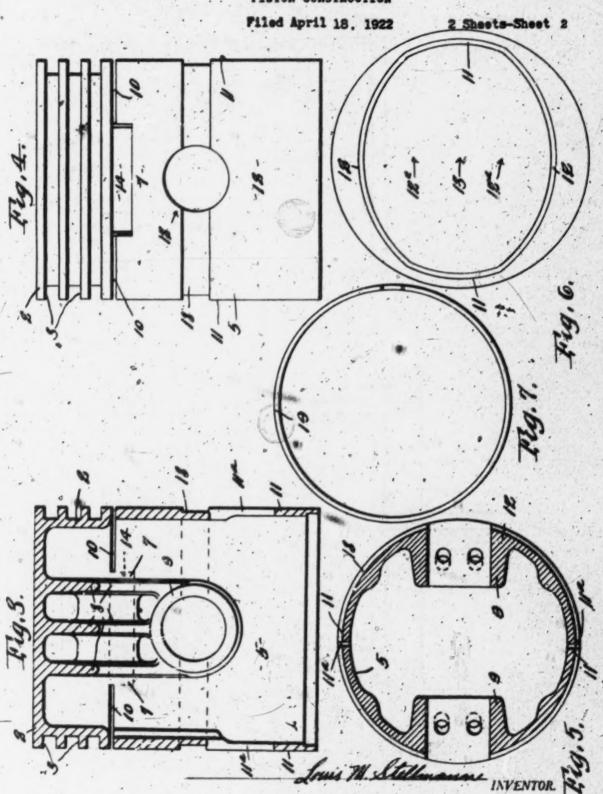
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L. M. STELLMANN

PISTON CONSTRUCTION



Paume Braill ATTORNEYS.

UNITED STATES PATENT OFFICE.

LOUIS M. SPELLMANN, OF STRACUES, NEW YORK, ASSIGNOR TO M. M. FRANKLIN MANU-PACTURING COMPANY, OF STRACUES, NEW YORK, A CORPORATION OF NEW YORK.

PERSON COMPERCIONES.

Application fied April 18, 1886. Serial No. 804,748.

To all volon it may concern.

Be it known that I Louis M. STRIZEANTS a citizen of the United States, and a resident of Syracus. In the county of Oscaslage and State of New York, have invented a certain new and unful Plates Construction of which the following is a specification.

This invention points to pitton score particularly the interval combustion on gines which visions are decread of a cotal as aluminum alley, having a greater coefficient of expansion than the grinder walls which are noselly of cast from and has for its object as expansible picton having a portion of its shirt or show filling and conforming to the splinter at all temperatures of the against and other portions of its short or stirt meanably speed spect from the cylinder walls and acvaits or expansible conform to the energy theory the sylinder walls to conform to the energy theory its printer or the properties of the angine, the expansible portions arriving the wrist purposed in the operations of the angine, the expansible portions energying the wrist purposes are excellently appreximately two thirds of the cylinder.

The investion consists in the novel for turns and in the conditional and con-

In describing this investion, reference is had to the accompanying drawings in which like theretoes to grade consuppreding markets all the views

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Pigers & Companies of the process of the cyltrating the position of the process is the cylinder the demands or expensive procises or walk of the purious being companied to

elearly illustrate the operation or expansion of the piston relatively to the cylinder.
Figure 7 is a detail view of the ring for

Figure 7 is a detail view of the ring for holding the wrist pine from displacement.

This plates compeless a head portion provided with the usual groover for the piston rings, and a shows the sleeve having dismetrically opposite contributions extending in arts of greater radius than the normal radius or the radius of dismetrically opposite concentric portions of the piston arranged between the expansible portions.

The concentric portions are arranged on the bearing or threat sides of the pipton and are of considerably less width than the ecentric portions, and the pin homeoverried by the eccentric expansible portions.

I designates the piston having a head 9 provided with the usual grooves 3 for the piston rings 4

Is in the eleeve of the pinton which is onenected to the head by dismetrically opposite integral portions at 7 and also by internal brackets for wate 8, the connecting portions 7 and wate 8 being located above the pin-

the sleet is the appearance than the bead by sleet to be and on disconsticulty opposite sides thereof on opposite sides of the constitute portions I and woke it.

The class of automatically excited the factors and the consentry poethods of the consentry poethods of the control of which elicably fit the local of the typical operation of which elicably fit the local of the typical operation of the consentry operation of the consentry radius that the radius of the consentry poethod of the consentry poethod of the consentry poethod on the radius of the consentry poethod by the consentry of t

and each constitutes approximately one-sixth of the sleeve, and the wrist pin bosses 9 project inwardly from the intermediate portions of the eccentric sides of the piston, seach of which constitute approximately one-third of the sleev

The outer faces of the sleeve are slightly tapered toward the lower end of the piston

as indicated in Fig. 5.

Preferably, the concentric portions 11 of the piston are formed with lengthwise slots 11° opening through the lower end of the piston and extending to a point above the

axis of the pin bo

The piston is shown as provided with peripheral recesses 14 on diametrically opposite sides thereof in the connecting por-tion 7 in line with the slots 10. These recesses perform no function in the use of the piston but are present for manufacturing purposes for the purpose of facilitating the cutting of the slots 10 by turning oper-

The slots 10 entirely separate the concen-25 trie end portions or walls of the sleeve

from the head and partly separate portions of the eccentric walls on opposite sides of the connecting neck 7 from the head.

The wrist pin bosses 9 as before stated, are carried by the eccentric or expansible portions on wills 18 of the sleeve and hence move radially during the expansion of such walls, and the wrist pin 15 is slidably or floatingly mounted in the wrist pin bos and it is also preferably slidingly or float-ingly mounted in the bearing 15 of the con-

necting god 17.

In order to prevent the wrist pin from sliding into engagement with the cylinder walls and scoring the cylinder, the piston is provided with means for holding the pin from axial displacement beyond the periphery of the piston.

ery of the piston.

In the illustrated embadiment of my invention, the sleeve is formed with a circumferential groove 18 which extends across the outer ends of the wrist pin bosses, and a retaining ring 19 is seated in the groove and thus prevents outward movement of the wrist pin.

In case the piston pin becomes broken in use the ring 19 holds the fragment thereof

from dropping down into the engine base and damaging other pers of the engine.

In operation, the piston is placed in the cylinder with the concentric portions 11 fitting the bore of the cylinder and holding the piston from slapping. As the piston becomes heated, the eccentric portions 15 thereof expand or bow catwardly toward or into continuations of the arcs of the concentric portions 11 and relieve undue tightcentric portions 11 and relieve undue tightbetween the concentric portions 11 and the cylinder walls.

This piston construction is particularly

advantageous in pistons made of aluminum or aluminum alloy or some metal having a greater coefficient of expansion than the cylinder, in that the piston is made to fit the cylinder at all temperatures of the engine, without relying upon resiliency of the metal. Hence, the liability of a resilient metal taking a permanent set is eliminated as in compres sible pistons which sooner or later take a permanent set, and become sloppy.

What I claim is.

1. A piston for internal combustion engines comprising a head and a sleeve, the sleeve being alightly elliptical in general form in cross section, and the sleeve being so formed with longitudinal slots arranged in the end walls of the elliptical form, the sleeve having pin bosses extending inshe end walls of the ulliptical form, the sleeve having pin bosses extending inwardly from the long walls of the alliptical form along a short diameter of the sliptical form and each of the long walls of the ellipse being approximately one third of the sleeve, substantially as and for the purpose specified.

2. A piston for internal combustion en-

gines comprising a head, and a sleeve, the sleeve having diametrically opposite portions of its wall of equal width concentric with the axis of the piston and other diametrically opposite ecosatric expansible portions between the concentric portions portions between the concentric portions their outer frees of greater in than the concentric portions and low within continuations of the area of the er faces of the concentric portions constituting approximally one-third of the above, the concentric portions being formed with lengthwise opening through the lower and of the shand pin bosses projecting inwardly from eccentric portions substantially midway tween the concentric portions substantially midway tween the concentric portions. and for the pu

& A pi of the ly midway betw

4. A piston for inte

gines having a head and a sleeve, transverse slots in diametrically opposite sides of the piston separating the opposite side portions of the head from the sleeve, whereby the shead is connected to the sleeve between the ends of the slots, the sleeve being slightly elliptical in general form in cross section, the ends of the alliptical form being concentric with the axis of the piston, and wrist pin bosses projecting from the portions of the sleeve joined to the head between the ends of the slots, the axis of said. tween the ends of the slots, the axis of said pin bosses extending along the short di-ameter of the elliptical form, substitutially as and for the purpose specified.

5. A piston for internal combustion en-

gines having a head and a sleeve, transverse slots in diametrically opposite sides of the piston separating the opposite side portions

of the head from the sleeve, whereby the shead is connected to the sleeve between the head is connected to the sleeve between the ends of the slots, the sleeve being slightly alliptical in general form in cross section, the ends of the elliptical form being concentric with the axis of the piston, and wrist pin bosses projecting from the portions of the sleeve joined to the head between the ends of the slots, the axis of said pin bosses axisnding along the 1 hort diameter of the elliptical form, the 1 see res being also formed so with lengthwise slots midway between the ends of the transverse slots, substantially as and for the purpose set forth. as and for the purpose set forth.
In testimony whereof, I have hereunto

signed my name, at Syracure, in the county as of Onondage, and State of New York, this ——day of February, 1993.

LOUIS M. STELLMANN.

DEFENDANTS' EXHIBIT 4-H (26).

Prior Art Patent.

U. S. Patent No. 1,842,022, Jan. 19, 1932,

To S. D Hartog.

Piston.

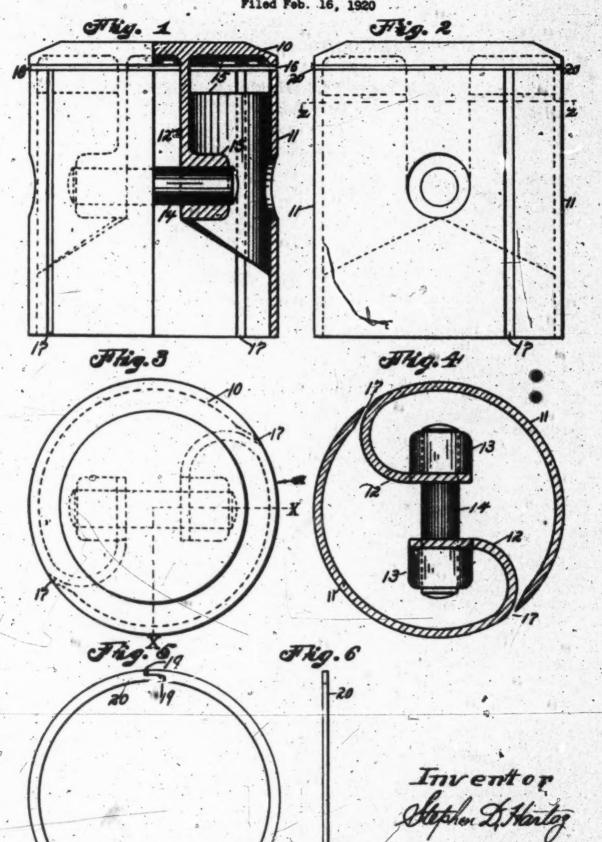
(Filed January 27, 1934.)

Jan. 19, 1932.

S. D. HARTOG

1,842,022

Filed Feb. 16, 1920



UNITED STATES PATENT OFFICE

PTEPHEN D. MARTON, OF ST. LOUIS, MISSOURI, ASSIGNOR, BY MISSIE ASSIGNMENTS. TO THE CLEVELAND TRUST COMPANY, OF CLEVELAND, ONIO, A CORPORATION OF

PIETON

Application filed February 16, 1988. Serial Me. 209,137.

This invention relates to piston, more par-ticularly to pistons for use in internal com-

ticularly to pistons for the in histonic bustion engines.

The piston is the moveble member within the cylinder of the engine and in the internal combustion angine the head portion of the piston is subjected to direct contact with the high heat temperature caused by the frequent explosions of the ignited gases. The piston unlike the cylinder is not provided with means for cooling or controlling its temperature and the head portion thereof, quite frequently attains a temperature of 150 to 1000 degrees. Fahrenhelt. This heat temperature causes the piston to expand and this expansion of the piston is greater than that of the cylinder in which it operates, consequently, the piston must be smaller in diameter than the der in which it operates, consequently, the piston must be smaller in diameter than the diameter of the bore of the cylinder to admit of its expension allowing the piston movable action in the cylinder free from hinding, which would otherwise occur were the piston made to a size to fit the cylinder when cold.

The head portion of the piston receives its heat by direct contact, the body portion by transmission, the head portion therefore must be made smaller than that of the body

portion.

The pieten as thus made would yet be unsuccessful operatively if it were not for the use of split metallic packing rings employed solely to pack the space between the piston and the cylinder and ordinarily positioned in grooves out in the head section of the piston and packing rings therein lack the requisite feetures of a more desirable construction in that the looseness of the piston tends to wear the cylinder or, of cylindrical truth. The delicate structure of the rings causes them to lose their tension due to the high heat temperature to which they are subjected, cause quently, failing in these function to properly pack the sylinder against leakage examing lose of camprossion, also parmitting the subricating oil notionly to enter the combustion chamber resulting in irregular ignition, but also permitting lubricating oil to secrete beneath the rings between their inner surface and the bottom of the grooves resulting in

the formation of carbon therebetween caus-ing a solid mass to form which forces the rings against the cylinder wall and not infre-

quently results in scoring the cylinder.

The present invention is designed to overcome all of the objections above described and as inhering in the prior art construction, by as inhering in the prior art construction, by constructing the piston in such a novel way as will eliminate the objections referred so and to such ends the invention comprises a piston having a head and body free from ring grooves. The head and body united by suitable ribs constructed in a manner providing a yielding capacity. The body of the piston being perted from the head and a slit or series of slits cut through the body and terminating at the parting between the head and the body. Sealing means for the head and body and positioned in the space therebetween.

The object therefore, of the present invention is to construct a piston free from rings and ring greoves, a piston made the reverse of present practice in that it is initially larger in diameter than the diameter of the hore of the cylinder, a piston characterised by the feature of being expansible and contractable automatically under the varying condition to which it is subjected, a piston enabled, by its construction, to fit the cylinder saugity at all times.

For the purpose of enabling others to electly understand, make, and operate this insention the following description is given supplemented by the accompanying draw-sings, in which:

Figure 1 is a vertical elevation partly in a motion as of the line X—X Figure 5. Figure 2 is a vertical side elevation viewed in the direction indicated by the arrow (g. **

Figure 3 is a plan view.

Figure 4 is a plan view in section of Figure 2 as of the line Z—Z Figure 2.

Figure 5 is a fragmentary view in elevation of a member part of this construction.

Figure 6 is a cide view of Figure 5.

In the drawings like numerals of reference indicate corresponding parts throughout the several figures. The numeral 10 designates

the head portion of this construction, 11 the body portion, the portions 10 and 11 are united integrally by internal ribs 19 a portion of which has an intersection integrally with the head 10 and the other portion extends radially and has its intersection with the body 11. The ribs 19 have bosses 18 form thereto which are drilled or bored to receive a pin 14 which connects the piston with the other operable parts of the engine. The ribs other operable parts of the engine. The ribs unite the head 10 and the body 11 and also to support bosses 18, experience has proven this construction to have an advantage in that of preventing distortion of the body 11, due to es to which a piston is a bjected by reason of the angularity of the different po reason of the angularity of the different positions of the connecting rod while the engine
is in operation. The ribs 12, in this case carry
the parts connecting the piston with the engine more yieldingly than would be the case
were the bosses 13 directly supported by the
body 11, resulting in a more smoothly running
engine having less vibration. The radially
extending portion of the ribs 12, is not connected with the head 10, there being a space
15, between the under side of the head 10,
and the upper end of the ribs 12, this permits
the U shaped cross section of the ribs 12, to the U shaped cross section of the ribs 12, to have a yielding effect when in operation both in lateral and circular direction, that is to say the body 11, will yield diametrally and circularly when subjected to pressure from the

In the manufacture of this improved construction of piston the head 10, the body 11, with ribe 12, and bosses 13, are cast to form from cast iron or suitable alloy composition metal the hole in the bosses 18, for the connecting pin 14, is cored to approximately the size to which it is finally to be finished the cored hole extending through the body 11, in alignment with the hole in the bosses 18, the space 15, between the under side of the 45 head 10, and the top of the radial portion of the ribs 12, is also cored at the time of casting the entire body. The external surface of the head 10, and the head 11 is face of the head 10, and the body 11, is subjected to a machining process for the purpose 50 of dressing the head 10, and to size the body 11, so that it will properly fit into the cylinder. At this point a change is made just the reverse of that which is the practice in sizing the conventional type of pistons for instead of machining the body of the piston smaller than the bore of the cylinder into which it is to operate, as is the common practice, my improved piston is machined to a size approximately of .005 of an inch larger than the bore of the cylinder.

When the head 10, and body 11, are thus mechined to size the head 10, and the body 11, are then parted from each other at 16, by using a very thin parting tool and cutting through the body 11, adjacent the head 10, a very thin opening 16, is effected parting the

head 10, from the body 11.

The next operation is to cut very thin slits 17, adjacent the intersection of the radial ribe 12, with the body 11, cutting through the 70 body 11, and longitudinal of its axis terminating at the parting 16, just beneath the head nating at the parting 16, just beneath the head

10. The resulting consequences of this operation renders the body 11, resilient, that
is, the body will yield radially and circularly
so that it can be placed fensionally in a cylinder having a bore less in diameter than that
to which the piston was sized.

The piston thus made will fit the cylinder
very properly but it would not prevent the
compression leakage or the escapage of gases
through the parting at 16, between the edge

through the parting at 16, between the edge of the head 10, and the edge of the body 11. To effect a seal at the parting 16, a thin sheet metal ring 18, Figures 5, and 6, is inserted into this space, this ring is split at 19, with lapping portions 20, one above the other for

a distance of shout 1/4 of an inch. The function of the split metal ring 18, is to

to seal the opening 16.

From the foregoing description it is clear that this construction fulfills the purpose for which it is intended. The body 11; being resiliently expansible and contractable renders the use of split metal piston rings unnecessary, doing away entirely with grooves cut in the piston for the rings, eliminating this source of danger to the cylinder by reason of the accummulation of carbon therein which tends to build up beneath the rings 160 forcing them against the cylinder walls caus-ing the scoring of the cylinder.

It is finally to be noted that the body

portion 11, is turned to a size over its full length to an amount approximately .005 of an inch larger than the bore of the cylinder into which it is to operate. The effect of splitting the body 11, at diametrically opposite position as at 17, and assisted by the U shaped portion of ribs 12, provides the coodition for majorar circular averages. tion for uniform circular expansion and con-

traction of the body 11, affecting a uniform tensional fit in the cylinder.

It is understood that minor changes may be made in the size, form and shape of this structure without departing from the spirit of this invention within the scope of the appended claims.

Having thus described the invention what I claim and desire to ascure by Letters Pat-

1. A piston having its head and body integrally connected by means of internal yield-ing ribs, a parting between the head and body, slits cut through said body, sealing means for said head and body, and means pro-vided on said internal ribs adapted to form engaging connection with operable parts for

2. A piston having internal yielding ribe 120

integrally connecting the head and body por-tions of said piston, said head and body por-tion being parted from each other, sealing means positioned in said parting between the

tion being parted from soch other scaling means positioned in said parting between the head and body alits out through the body portion of said piston providing resiliency for said body and means provided out said internal ribe sciapted to form engaging connection with operable parts for said piston.

In a piston of the class described, a outplike head comprising a pressure receiving and and a wall portion, a skirt circumstrustially disconnected from the wall portion of the head and divided from and to end, and skirt carriers connecting said skirt to the pressure receiving and, said skirt carriers being disconnected from the wall portion of the head and smooghtible of being slightly flexed radially.

C3

A piston comprising a head, a skirt having resilient sections separated from said head by a sit extending continuously around the piston, and means for yieldingly connecting said skirt sections with said head.

A piston having a skirt at least a portion of which is separated from the head by a slot in which a piston ring is adapted to be mounted, said portion of the skirt being supported from the head by a flexible interior rib member.

In confirmation hereof I hereto attach my signature.

STEPHEN D. HABTOG.

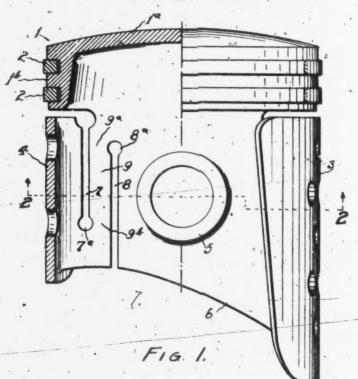
DEFENDANTS' EXHIBIT 4-H(27).
Prior Art Patent.
U. S. Patent No. 1,499,073, June 24, 1924,
To L. H. Pomeroy.
Piston.
(Filed January 27, 1934.)

1,499,073

L. H. POMEROY

PISTON

Filed Sept. 4. 1919



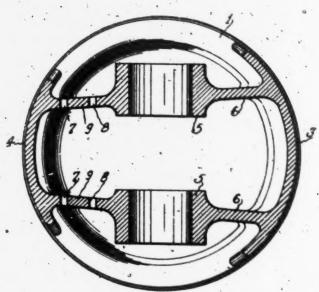


FIG. 2. Laurence Henry Pomeroy

By Ray & Sehr

hie attorney

UNITED STATES PATENT OFFICE.

LAURENCE HENRY POMEROY, OF CLEVELAND, OHIO, ASSIGNOR TO THE ALUMINUM COMPANY OF AMERICA, OF PITTSBURGH, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

FISTON.

Application filed September'4, 1919. Serial No. 321,696.

To all whom it may concern:

Be it known that I, LAURENCE HENRY Pomenor, a subject of the King of Great Britain and Ireland, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Pistons, of which the following is a specification, reference being had therein to the accompanying drawings

This invention relates more particularly to pistons adapted for use in internal combustion engines or under conditions in which the piston is subjected to considerable heat.

As is well known, the clearance with which 18 the pistons of internal combustion engines are fitted is determined in .. large measure by the difference in thermal expansion of the piston and the cylinder wall. This difference in thermal expansion is due to the 20 fact that the working temperature of the piston is somewhat higher than that of the cylinder wall and, in some cases, to the use of different piston and cylinder materials having different co-efficients of thermal conductivity and expansion. Thus in the case of pistons of aluminum or magnesium alloys working in iron cylinders the co-efficient of expansion of the aluminum or the magnesium being higher than that of iron, it is 30 necessary to give the pistons a larger clear-ance than is required for iron pistons work-ing in iron cylinders. This larger clearance, with pistons as heretofore constructed, results in piston slap or knock when the 35 engine is running cold at starting and, in fact, whenever the thermal conditions of the cylinder and piston are such that the large clearance required to obviate seizure at high temperatures exists between the piston and 40 cylinder, wall.

One object of the present invention is the provision of a piston of aluminum alloy or other light weight metal, that will operate

without piston slap.

Another object of the invention is the provision of a piston so constructed that it can be given a small working clearance in-dependent of differences of thermal expansion of the piston and the cylinder wall.

A further object of the invention is the provision of a piston capable of adjusting itself to the cylinder as wear occurs of the piston or cylinder or both.

vision of a piston that will wear evenly from 55 end to end.

Another object of the invention is the attainment of the ends above mentioned in an integrally cast piston.

These and other more or less incidental oo objects, are attained in the manner set forth in the following description of the preferred form of construction.

In the drawings, Fig. 1 is a view partly in side elevation es and partly in section of a piston embodying the invention.

Fig. 2 is a section on the line 2—9, Fig. 1. My improvements are applicable to pistons of various forms of construction but 70 in the drawings, for purposes of explanation, I have shown the invention applied to the slipper type of piston shown in United States Letters Patent No. 1,294,833, to H. R. Ricardo.

Referring in detail to the construction illustrated, the piston has a head section 1 comprising a crown 1° and a side wall 1° which is formed with grooves to receive suitable packing rings 2, 2. The guide section so of the picton comprises diametrically opposite cylinder-engaging slippers 8 and 4, a pair of wrist pin bosses 5, 5 arranged between the slippers, and a pair of webs 6, 6 which join the slippers and bosses together 85 and extend upward and merge with the crown and side wall of the head section of the piston, the entire piston being cast in one. Aside from the rings 2, 2, only the slipper parts 3, 4 are designed to contact so with the cylinder wall, the piston differing in this respect from the prior trunk or skirted pistons which have a guide part in the form of a continuous sleeve or skirt that contacts with the cylinder wall on all sides.

In the construction shown the slippers 3 and 4 are made unequal in size, the larger slipper 3 being designed to take the angular thrust or reaction of the connecting rod during the explosion stroke of an internal com- 100 bustion engine, while the smaller slipper 4 is designed to take the angular thrust during the compression stroke of the engine. The above described features of the construction are characteristic of the Ricardo 106 slipper piston.

ly improvements constituting the present Another object of the invention is the pro- invention are effected by forming the piston

so that some part of the guide structure is the piston as compared with the surrounding. capable of resiliently yielding at points between the cylinder-engaging surfaces on opposite sides of the wrist pm to compensate 5 for differences in thermal expansion of the piston and cylinder and I prefer to make the guide structure so that it will yield more readily between the wrist pin bosses and the cylinder-engaging surface which takes the. 10 thrust during the compression stroke of the piston, than between said bosses and the cylinder-engaging surface which takes the thrust during the explosion stroke. The means, when applied to the slipper type of 15 piston illustrated, that the major yield shall occur between the pin bosses 5 and the cylinder-engaging surface of the slipper 4, and in the construction illustrated I have made provision for a resilient yielding in the webs 6, 6 which permits movement of the slipper 4 toward and from the slipper 3. relative movement of the slipper 4 in parallelism, the web structure is formed to yield in two separated sections, which are preferably adjacent the respective ends of the slipper.

In the construction illustrated this is accomplished by forming each of the webs 6 with two parallel slots 7 and 8, the slot 7 30 being open at its upper end and closed at its lower end, while the slot 8 is closed at its upper end and open at its lower end. slots 7 and 8 terminate at their closed ends with enlarged cylindrical aperatures 7° and 35 8°, respectively. Thus it will be seen that the slipper 4 is supported by elongated strips or sections 9 of the webs 6, and each of the sec-tions 9 has reduced and weakened cross sections at 9° and 9°, so that any yielding of the web structure is localized at these points

9° and 9°.

My improved form of construction can be applied to pistons cast of any suitable metal but it is especially useful in connection with pistons of aluminum alloy or other light metals having high co chicients of thermal expansion in comparison with iron as it makes it possible to fit such pistons with as small a clearance as is possible with iron pistons of prior forms of construction. Fron pistons of internal combustion engines fitted with a clearance of 0.06575 inch per inch of piston diameter are found to operate with substantial freedom from piston slap, and 55 pistons of aluminum alloy made in accordance with my invention can readily be operated with similar clearances. Indeed a still smaller clearance is made possible by my invention.

my improved form of construction, asuming a cold working clearance of 0.00075 inch

cylinder wall of iron will reduce this clearance; but as the clearance approaches zero the construction of the piston webs permits them to yield so as to compensate for the 70 excess expansion of the guide section of the piston and all danger of the seizing of the piston is obviated. When the engine is stopped and the parts again cool down the resilience of the web structure causes it to 75 return to normal form and a suitable small clearance between the piston guide and the cylinder wall is maintained. It will, of course, be understood that the piston head proper is given a smaller diameter than the 80 ruide and does not function as a guide. As has been explained the yielding of the web structure occurs at the points 9 and 9 adjacent to the upper and lower parts of the slipper 4 so that the slipper 4 is maintained 85 in parallelism with the axis of the cylinder. This insures uniform contact and wear throughout the full length of the slippers. As only a relatively light thrust, incident to the compression of the combustible charge in 90 the engine cylinder, is applied to the smaller slipper 4, the resilient web structure is able to sustain the stresses to which it is subjected, it being possible, of course, to make the guide structure between the wrist pin 95 bosses and the cylinder-engaging surface of the slipper 3 adequately strong to sustain the heavy thrust due to the explosion of the engine charge. This is an important feature of my invention since in most, if not 100 all, cases it is found that a construction that is capable of yielding sufficiently to ade-quately compensate for differences of expansion, will fail if subjected to the angular thrust of the connecting rod in the working store explosion stroke of the piston.

It is to be understood that the dimensions of the yieldable web sections, as at 9 and 9, will be determined by the diameter of the piston and other factors such as the com- 11 pression pressure and the maximum engine speed, the requirements being that the web sections 9 and 9 yield sufficiently to prevent seizing under the pressure set up between the cylinder wall and the piston due to ther- 155 mal expansion, but do not yield too much under the thrust due to compression and inertia, and that they yield, whether under said expansion pressure or under the thrust due to compression and inertia, in a manner 120 to maintain the slipper 4 parallel to the pis-

ton axis.

It will be seen that the amount of yielding in the piston webs will be determined, for In the operation of aluminum pistons of the most part, by the cold working clear- 125 ance of the piston. By making this clearance sufficiently small the clearance will be per inch of piston diameter, or less, to insure rendered nil when the parts heat up in oper-freedom from piston alap when starting, as ation and a resilient pressure of the slippers the engine heats up the excess expansion of against the cylinder wall will be secured. 130

Under these conditions the resiliency of the ture being adapted to resiliently yield to piston web structure will insure the maintenance of close working contacts between the slippers and the cylinder wall as wear of these parts occurs and, as above noted, the movement of the slipper 4 parallel to the piston axis will insure a uniform contact and wear of the parts throughout the full lengths of the slippers. In other words, my 10 resiliently yieldable piston structure, by compensating for excess expansion of the piston, secures an automatic adjustment of the piston to the cylinder as wear occurs.

My improvements, while applicable in 15 their broader aspects to other types of pistons, are especially applicable to the slipper type of piston illustrated and it will be seen hat this is due, in part at least, to the fact that the yieldable web parts have no contact 20 with the cylinder wall and thus are free, in so far as the cylinder is concerned, to accommodate themselves to the movement of those parts which do engage the cylinder.

It is obvious that my invention can be 25 embodied in various forms of construction and it is to be understood that it is not limited to the particular construction illustrated in the drawing except as specified in the following claims.

What I claim is:

1. An integrally cast piston comprising a head, diametrically opposite guide slip-pers, a pair of wrist pin bosses between the slippers and a pair of webs joining the head, slippers and bosses together, said webs being formed at points between the bosse and one of the slippers so as to resiliently yield and permit movement of said slipper toward and from the other slipper.

2. An integrally cast piston comprising a head, diametrically opposite guide slippers, a pair of wrist pin boss es between the slippers and a pair of webs joining the head, slippers and bosses together, said webs being formed at points between the bosses and one of the slippers so as to resiliently yield and permit movement of said slipper in parallelism toward and from the other slipper.

3. An integrally cast piston comprising a head, diametrically opposite guide shippers, a pair of wrist pin bosses between the slippers and a pair of webs joining the head, slippers and bosses together, said webs being formed between the bosses and one of the. of which one is open at its end adjacent the piston head and the other is open at its end away from said head.

4. A piston comprising a head and a guide structure connected thereto having wrist pin bosses and cylinder engaging surfaces on opposite sides of the bosses, the guide struc-

a greater extent between the pin bosses and one of said cylinder, engaging surfaces than between the said pin bosses and the other

cylinder-engaging surface

5. A piston having a head and a guide structure connected thereto, said guide structure comprising diametrically opposite parts 7 having cylinder-engaging surfaces, wrist pin bosses, between said opposite parts, and means for joining said bosses and cylinderengaging parts, said joining means being arranged not to engage the cylinder and the 75 guide structure being adapted to resiliently vield to a greater extent between the pin bosses and one of said cylinder-engaging surfaces than between the said pin bosses and the other cylinder-engaging surface.

6. A piston having a head and a guide structure connected thereto, said guide structure comprising diametrically opposite slippers having cylinder-engaging surface wrist pin bosses between the slippers and means joining said bosses and slippers to-gether, the guide structure being adapted to resiliently yield to a greater extent at points between the pin bosses and the cylinderengaging surfaces of one slipper than between the said pin bosses and the cylinderengaging surfaces of the other slipper.

7. A piston having a head and a guide structure connected thereto which comprises diametrically opposite cylinder-engaging parts, wrist pin bosses between the cylinderengaging parts, and means joining said bosses and cylinder-engaging parts together, the said joining means being resiliently yieldable to a greater extent on one side of 100 the wrist pin bosses than on the other side, thereof.

8. A piston having a head and a guide structure connected thereto which comprises diametrically opposite slippers, wrist pin 10 bosses between the slippers and means joining said bosses and slippers together, the said joining means being resiliently yield-able to a greater extent on one side of the wrist pin bosses than on the other side there-

9. A piston as claimed in claim 4 characterized by being integrally cast.

10. A piston as claimed in claim 5 char-

acterized by being integrally cast.

11. A piston as claimed in claim 6 characterized by being integrally cast

12. A piston as claimed in claim 7 characterized by being integrally cast,

18. A piston as claimed in claim 8 char- 190

acterized by being integrally cast.
In testimony whereof, I hereunto affix my signature.

LAURENCE HENRY POMEROY.